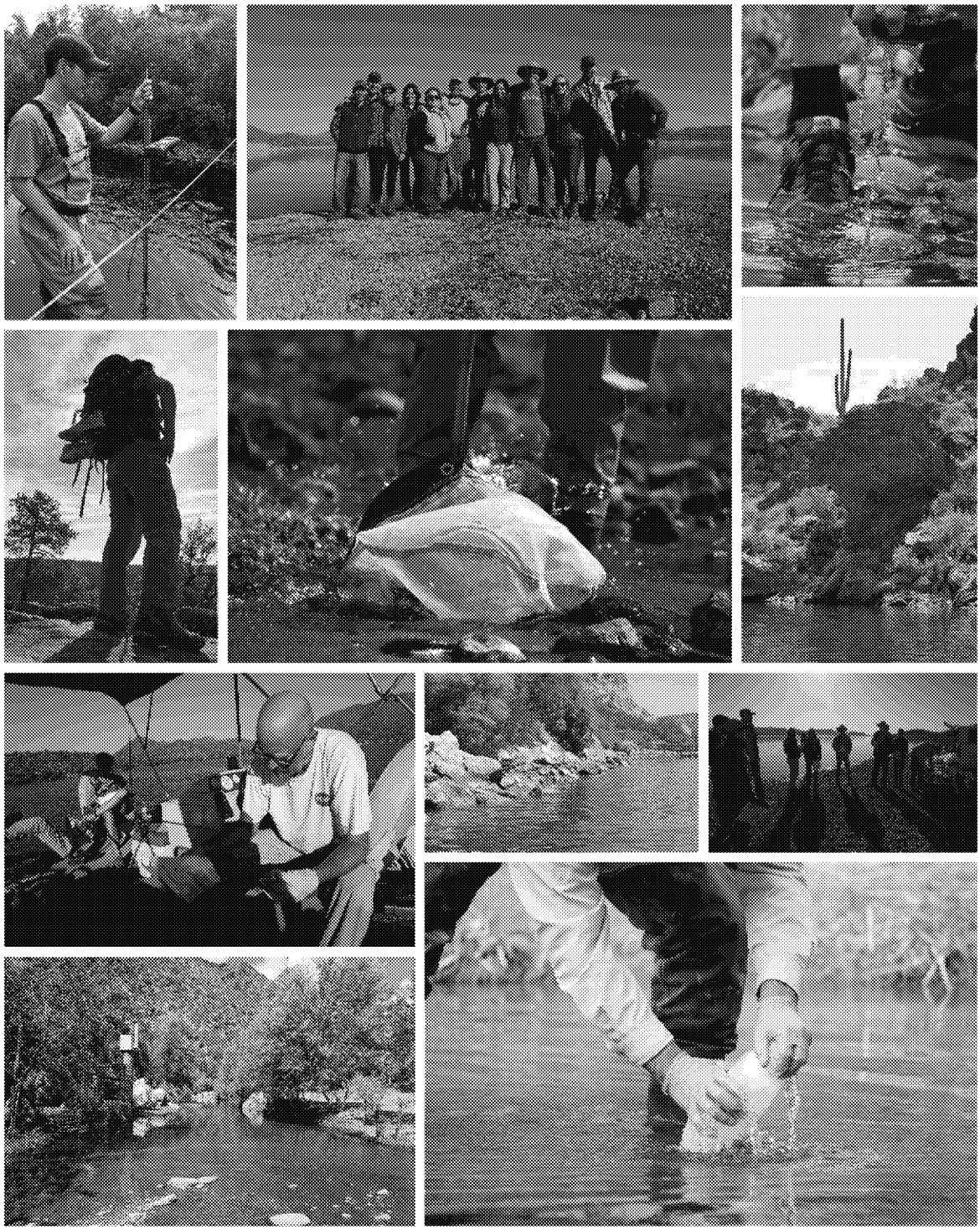
ARIZONA'S 2022 CLEAN WATER ACT ASSESSMENT
(JULY 1, 2012 TO JUNE 30, 2021)

Integrated 305(b) Assessment and 303(d) Listing Report

Revised March 2022



Appendix A – 2022 Assessment Decisions

Appendix B – 2022 Critical Conditions

Appendix C – 2022 Impaired Waters List

Appendix D – 2022 TMDL Priority Ranking

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CHAPTER 1 – INTRODUCTION

The 2022 Clean Water Act Assessment (hereafter referred to as the assessment) covers data collected from July 1, 2012 to June 30, 2021. The purpose of this report is to conduct a comprehensive analysis of water quality data associated with Arizona's surface waters to determine whether surface water quality standards are met and designated uses are being supported. This report is due to the U.S. Environmental Protection Agency (EPA) by April 1, 2022.

The assessment serves three functions.

1. For ADEQ, it identifies waters that need to be protected, maintained or restored. This comprehensive evaluation of water quality in Arizona is used to set priorities, allocate resources, and make decisions about land use activities, discharges to the water, future monitoring, and program initiatives.
2. Nationally, it fulfills a reporting requirement of the Clean Water Act, and is submitted to the EPA. The report is used to inform national water quality issues and concerns.
3. For the public, it provides an opportunity to learn about and comment on the status of water quality in Arizona.

WHAT IS THE ASSESSMENT DECISION FOR MY WATERBODY AND HOW WAS IT DETERMINED?

Appendix A includes assessment decisions. [HYPERLINK \l "_Chapter_3_-"] includes the methodology for how a waterbody was assessed. In addition to Appendix A, ADEQ has developed an optional '[HYPERLINK "https://azdeq.shinyapps.io/assessment_dashboard/"]' which allows users to interactively view assessment data. The dashboard shows the aggregated decisions listed in Appendix A as well as the raw data used to make each decision. Instructions for how to use the dashboard are on the '[HYPERLINK "https://azdeq.shinyapps.io/assessment_dashboard/" \l "section-readme"]' page.

PUBLIC COMMENT AND APPEAL UPDATES

The assessment can be updated throughout the process due to public comments, appeals, or EPA disapprovals.

Public Comment Updates

The public comment process is described in [HYPERLINK \l "_Step_3_-"]. The 30-day public comment period for the 2022 assessment started on December 6, 2021 and ended on January 6, 2022. ADEQ's response to public comments were published in the Arizona Administrative Register on February 18, 2022 at [HYPERLINK "https://apps.azsos.gov/public_services/register/2022/7/contents.pdf"]. ADEQ is required to wait 45 days from the Arizona Administrative Register publication date before submitting to EPA.

The following changes were made as a result of public comments:

- Skunk Creek (15070102-003) and New River (15070102-002) were removed from the impaired waters list. The City of Glendale demonstrated that the sampling locations were not actually in Skunk Creek or New River but were adjacent to the washes in their public comments.
- Critical conditions in Appendix B for Davidson Canyon (15050302-153A) have been updated.

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Appeal Updates

[HYPERLINK \l "_Step_4_-"] outlines the process for submission to the Arizona Administrative Registrar. The following changes were made due to an appeal by the City of Phoenix:

- Indian Bend Wash (15060106B-179) was removed from the impaired waters list. The City of Phoenix demonstrated that the sampling location was not actually in Indian Bend Wash but was adjacent to the wash in comments submitted after the close of the public comment period.

EPA Updates

The process for EPA updates are covered in [HYPERLINK \l "_Step_6-_EPA"]. This step is currently in process. ADEQ submitted the 2022 Assessment to EPA for review on April 5, 2022. Any changes due to EPA disapprovals will be recorded in this section.

REGULATORY AUTHORITY

The Clean Water Act

In 1972, Congress passed the Federal Water Pollution Control Act, commonly known as the Clean Water Act. The goal of this act is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters. ADEQ implements the Clean Water Act in Arizona with oversight from the EPA. ADEQ conducts water quality assessments and determines which surface waters are meeting standards (attaining) or not meeting standards (impaired). This document addresses federal monitoring, assessment, and listing requirements found in Sections (§) 106, 205, 303, 305, and 314 of the Clean Water Act.

- §106 and 205 require the states to compile, analyze, and annually submit a report on surface water quality. The report is to include monitoring conducted by ADEQ and other monitoring entities under grants and contracts with ADEQ.
- § 303 requires ADEQ to adopt, with EPA approval, water quality standards and review these standards every three years. § 303 also requires states to monitor waters and submit a list of impaired surface waters. These impaired waters are prioritized for the development of a Total Maximum Daily Load (TMDL) for each pollutant causing an impairment. As part of the TMDL process, ADEQ must either set appropriate controls or work with stakeholders to implement actions that will improve water quality, so that the waters meet water quality standards.
- § 305 requires an assessment report that describes and analyzes water quality conditions of all surface waters in Arizona. This assessment report defines the extent that state waters are meeting water quality standards.
- § 314 adds further requirements specific to lakes.

Federal Regulations and Guidance

The Federal Code of Regulations § 122, 124, and 130.7 establish further and more specific federal requirements concerning the identification of impaired waters (referred to as "water quality limited waters"). EPA published the Consolidated Assessment and Listing Methodology (CALM) in 2002. ADEQ has adopted many of the ideas published in this document, such as core parameter coverage. The CALM document provides information on monitoring network design and use of chemical, biological, toxicity, bacteria, and habitat data to support assessments. It also provides technical

support such as statistical considerations for data quality objectives and hypothesis testing (EPA, 2002).

EPA publishes memorandums, which address current criteria for each assessment cycle. A copy of this guidance can be downloaded at [HYPERLINK "https://www.epa.gov/tmdl/integrated-reporting-guidance-under-cwa-sections-303d-305b-and-314"]. Since 2001, EPA has recommended that the states submit an integrated report that includes both the assessment required under §305(b) and the list of impaired waters required under §303(d).

Waters Included in the Assessment

On August 30, 2021, the U.S. District Court for the District of Arizona vacated the Navigable Waters Protection Rule (NWPR), returning the Waters of the United States (WOTUS) definition and the jurisdiction of the Clean Water Act to the pre-2015 regulatory regime. The definition of WOTUS establishes the federal jurisdiction of the Clean Water Act. This assessment accounts for the vacatur and uses the list of waters that were regulated in Arizona prior to the promulgation of the NWPR. ADEQ is actively evaluating waters for jurisdictional status, which may change how a specific water is regulated. Therefore, the waters listed in this assessment represent only a point in time, and jurisdictional status should be evaluated for any current and future permitting or assessment purposes.

Arizona's Surface Water Standards and Designated Uses

The assessment uses the 2016 standards which have been approved by EPA (see [HYPERLINK "https://static.azdeq.gov/wqd/SW_Standards_12_31_16.pdf"]). The 2019 standards have been published in the Arizona Administrative Register (A.A.R.) but not approved by EPA. ADEQ submitted the 2019 standards in the triennial review to the EPA on November 19, 2019. As of November 30, 2021, EPA has not provided ADEQ a formal response to that submittal. Without EPA approval (or disapproval), the 2019 standards cannot be applied to this assessment.

ADEQ sets narrative and numeric surface water standards for water quality based on the ways people and wildlife use the water. These "designated uses" are specified in the standards for individual surface waters (A.A.C. R18-11 Appendix B). If the surface water is not named in the rule, the designated uses are determined by the tributary rule (A.A.C. R18-11-105). The tributary rule assigns designated uses based on flow regime and elevation.

Arizona's designated uses are:

- Aquatic Wildlife (cold water (AWC), warmwater (AWW), effluent-dependent (AWEDW), or ephemeral (AWE));
- Fish Consumption (FC);
- Body Contact (Full (FBC) or Partial (PBC));
- Domestic Water Source (DWS);
- Agricultural Irrigation (AGI);
- Agricultural Livestock Watering (AGL).

Unique standards have also been established for the following waters:

- Waters classified as an "Outstanding Arizona Water" identified in A.A.C. R18-11-112;
- Waters classified as effluent dependent waters;

- Waters with moderating provisions established in their National (or Arizona) Pollutant Discharge Elimination System (NPDES or AZPDES) discharge permits (i.e., mixing zones or a pollutant-specific variance);
- Waters with nutrient standards, as specified in A.A.C. R18-11-109(F);
- Colorado River reaches with salinity standards (three benchmark sites along the river between Hoover Dam and Imperial Dam) as specified in A.A.C. R18-11-110.

Site specific standards can also be developed for impaired waters where natural conditions alone would cause the standards to be exceeded.

Arizona's TMDL Statute

To align with the Clean Water Act, the Arizona Legislature promulgated Arizona Revised Statutes (A.R.S.) 49-234 in 2000, which identifies a general process for making impairment decisions and for developing TMDL reports and requires ADEQ to:

- Adopt, by rule, the methods used to identify impaired waters;
- Use only reasonably current, credible, and scientifically defensible data;
- Consider the nature of the water (e.g., ephemeral, intermittent, perennial, effluent dominated) in assessing whether an assessment unit is impaired;
- Determine whether pollutant loadings solely from naturally occurring conditions are sufficient to exceed a water quality standard;
- Adopt narrative standards and biocriteria implementation procedures through a public process before using these to identify impaired waters.

The statutes were updated in 2021 to include Arizona's new surface water program.

Arizona's Impaired Water Identification Rule

Arizona developed the Impaired Water Identification Rules (A.A.C. R18-11-601 through 606) in 2002. These rules establish methods and criteria to:

- Determine when an assessment unit (stream reach or lake) is impaired;
- Determine when an assessment unit is no longer impaired;
- Prioritize the development of TMDLs;
- Determine whether a dataset is "credible," and therefore, used for assessments and TMDL development;
- Consider contextual information in a weight-of-evidence approach;
- Define spatial and temporal independence.

To determine if a water is impaired, there are three requirements; a water quality standard, an implementation procedure and Impaired Water Identification Rule (IWIR) authorization. At present, the IWIR only authorizes assessing waters for impairments using the numeric water quality standards. Authority in the IWIR and implementation procedures would need be developed to apply narrative standards such as bottom deposits, supporting aquatic life, odor, oil and grease, suspended solids in water treatment plants, trash and lake nutrient standards. If needed and with stakeholder input, ADEQ may propose updates to the IWIR in a future rulemaking.

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The Impaired Water Identification Rule does not establish methods for identifying waters that are supporting their uses. [HYPERLINK \l "_Chapter_3_-"] of this document details how "use support" and "attainment" decisions are made.

CHAPTER 2 – ARIZONA'S 2022 ASSESSMENT

ASSESSMENT HISTORY

This report is Arizona's 22nd assessment since the creation of the Clean Water Act in 1972. Since the IWIR was implemented in 2002, six assessments have been completed. The 2022 report will be the seventh.

Figure 2-1 shows the number of waterbodies assessed during each assessment cycle since the IWIR was created. The number of decisions counts the number attainment and impairment decisions. The **number of impaired waterbodies** describes how many lakes or streams do not support at least one designated use. Generally, the number of waterbodies assessed has increased, with the number of decisions and **number of impaired waterbodies** following suit. Ideally, the gap between the number of streams assessed and the number of decisions made should be zero, which indicates that data gaps (inconclusive decisions) were addressed. ADEQ is working to fill these gaps in annual sampling and analysis plans, but additional resources may be necessary.

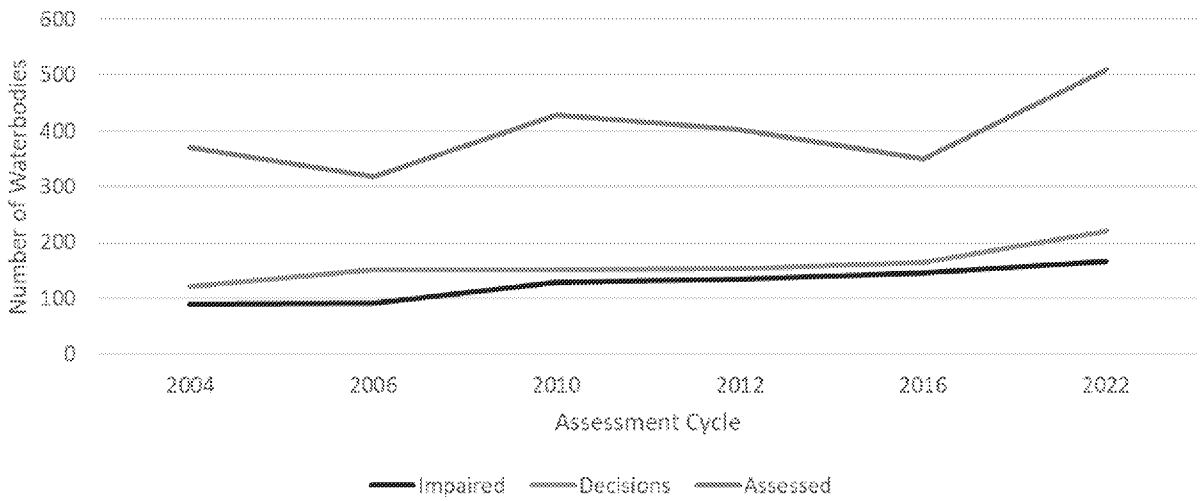

Figure 2-1. History of Assessment Decisions.

CONTRIBUTIONS BY ORGANIZATION

Data gathered by ADEQ and external entities/data sharing partners were used in the 2022 assessment. Approximately half of the data used in the assessment was from external sources (Figure 2-2).

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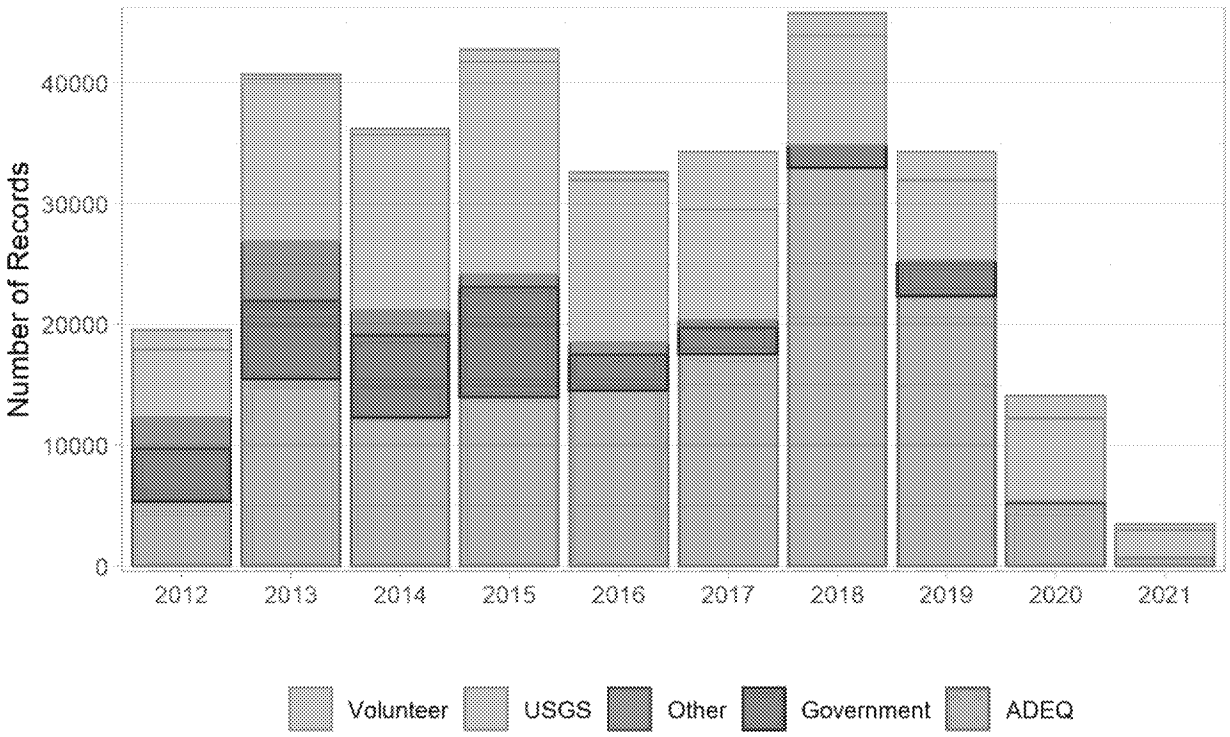

Figure 2-2. Data used in the 2022 Assessment by organization.

1. Arizona Department of Environmental Quality
2. United States Geological Survey
3. Adventure Scientists
4. Aravaipa Group
5. Butte Creek Restoration Council
6. Colorado River Water Quality Improvement Program
7. Coronado Resource Conservation & Development
8. Friends of the Forest
9. Friends of the Tonto
10. Gila Watershed Partnership
11. Oak Creek Watershed Improvement Council
12. Prescott Creeks
13. Sierra Club
14. Verde River Institute
15. Arizona Game and Fish
16. Arizona State Parks Park
17. Bureau of Land Management
18. Bureau of Reclamation
19. City of Tucson
20. City of Tempe
21. National Park Service
22. Pima County
23. Slide Rock State Park
24. US Fish and Wildlife Services
25. US Forest Service
26. US Environmental Protection Agency
27. Allied Signal Engines
28. ASARCO
29. BHP
30. Capstone Mining
31. Golder and Associates
32. Hargis & Assoc. Inc.
33. International Boundary and Water Commission
34. Pinal Creek Group
35. Resolution Copper
36. Salt River Project
37. University of Arizona
38. Walker Ecological Services

Recall that the 2022 Assessment window is from 7/1/2012 to 6/30/2021, which accounts for the lower record count for 2012 and 2021 as only half those years were part of the assessment. In 2020, the COVID-19 pandemic impacted on data collection from all agencies except USGS.

WATERBODY ASSESSMENT SUMMARY

Arizona has approximately 108,559 stream miles and 285,962 lake acres based on the U.S. Geological Survey (USGS) National Hydrography Dataset (excluding Indian reservations). A low percentage of the state's surface waters are assessed when compared to the total number of stream miles or lake acres. This is primarily due to the fact that the majority of waters in Arizona are ephemeral (flow only in response to precipitation) or intermittent (only flow seasonally) and not easily sampled. Monitoring ephemeral and intermittent waters is mostly limited to special investigations, such as TMDL development. Most monitoring used in the 2022 assessment is focused on perennial waters (waters that flow year-round).

The number stream miles and lake acres assessed are in Table 2-1, and waterbodies assessed are in Table 2-2. A total of 508 waters were evaluated for the 2022 assessment. There are **164 impaired waterbodies** in Arizona, which means that at least one designated use is **not supported** and at least one parameter is **not meeting criteria** for each waterbody. There are 54 waterbodies that are attaining. Attaining waterbodies have demonstrated support for all uses. 289 waterbodies are inconclusive. Inconclusive waterbodies are missing data to make an impairment or attainment decision.

Table 2-1. Waterbody Assessment Summary (Miles/Acres)

	Impaired	Inconclusive	Attaining	Assessed
Lake (Acres)	94792	4782	0	**99575**
Stream (Miles)	1120	2545	798	**4463**

Table 2-2. Waterbody Assessment Summary (Count of Waterbodies)

	Impaired	Inconclusive	Attaining	Assessed
Lake (Acres)	37	34	0	**71**
Stream (Miles)	127	256	54	**437**
Total	164	290	54	**508**

Assessed Waters by Category

EPA further breaks down the three types of waterbodies in Tables 2-1 and 2-2 into five categories. These categories are listed in Table 2-3, shown in Figure 2-3, and mapped in Figure 2-4. Generally, Category 1 waters are supporting all designated uses; Category 2 waters have data indicating they attaining some uses; Category 3 waters are inconclusive and do not have enough or no data indicating the water is or is not meeting standards for any use; Category 4 waters are divided into three parts (A, B, C) with 4A being the most common as an impaired water with a TMDL; and Category 5 waters are impaired waters with no TMDL. These categories are fully described in the '[HYPERLINK \l "_Assessing_at_the"]' section in Chapter 3.

More than one-third of waterbodies area supporting all or some uses (Category 1 and 2), and approximately another one-third is inconclusive (Category 3) make up a little under a third of the number of waterbody assessments for the 2022 assessment. Sixty-five waterbodies have a

completed TMDL (Category 4A), and 99 waterbodies are impaired with no TMDL (Category 5) (Table 2-3 and Figure 2-3).

Table 2-3. Status of Assessed Waters

Use Support Category	# Lakes	Acres	# Streams	Miles
Category 1 (Attaining All Uses)	0	0	54	798
Category 2 (Attaining Some Uses)	11	2397	118	1307
Category 3 (Inconclusive)	26	2385	135	1243
Category 4 (Not Attaining)	13	2884	52	312
Category 5 (Impaired)	24	91908	75	808
Total	**74**	**99574**	**434**	**4468**

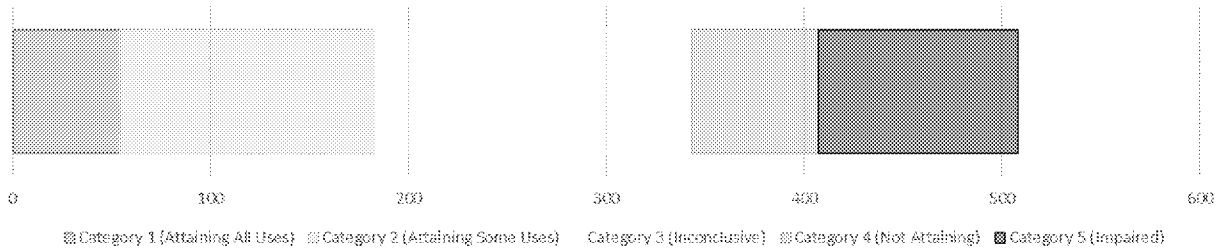

Figure 2-3. EPA category distribution.

Figure 2-4. Waterbody assessment by EPA category. Category 5 = Impaired No TMDL, Category 4 = Not Attaining TMDL, Category 3 = Inconclusive, Category 2 = Attaining Some Uses, Category 1 = Attaining All Uses. **Interactive map can be accessed** [HYPERLINK "https://adeq.maps.arcgis.com/apps/webappviewer/index.html?id=e224fc0a96de4bcda4b0e37af3a4daec&showLayers=Counties;Assessed%20-%20Draft%20Lakes%202022;Assessed%20-%20Draft%20Streams%202022;"].

USE ASSESSMENT SUMMARY

Figure 2-5 indicates the use level decisions. A waterbody can be assigned more than one designated use. Most uses are assessed as 'Supporting'. Uses assessed as 'Insufficient Information' are due to data gaps or exceedances that prevent a supporting or not supporting

decision. '**Not Supporting**' is the smallest portion of each designated use decision, except for Aquatic and Wildlife Ephemeral (AWE). Ephemeral streams are generally only sampled as part of a TMDL investigation to identify pollution sources, which means generally no data is collected on these waters unless a potential issue was previously identified.

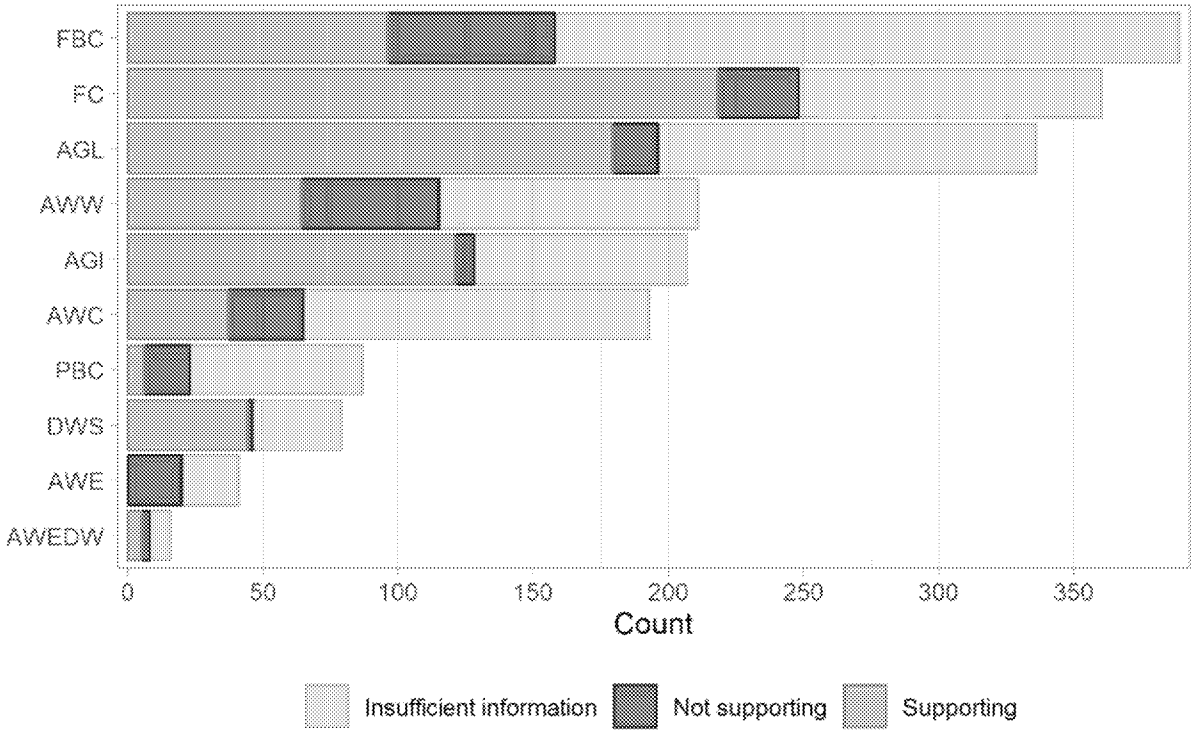

Figure 2-5. Designated Use Support Summary. Counts are the number of waterbodies for each group. FBC = Full Body Contact, PBC = Partial Body Contact, FC = Fish Consumption, AGL = Agriculture Livestock, AGI = Agriculture Irrigation, DWS = Domestic Water Source, AW = Aquatic and Wildlife and includes AWW for Warm, AWC for Cold, AWE for Ephemeral and AWEDW for effluent dependent water.

PARAMETER ASSESSMENT SUMMARY

Escherichia coli (*E. coli*) is the most common surface water quality impairment in Arizona, followed closely by copper (Figure 2-6). Most of the copper impairments are for the aquatic and wildlife use.

All the mercury impairments are due to fish consumption advisories and impact the fish consumption designated use. Fish consumption advisories are issued to inform the public about possible adverse health effects and contain recommendations for how many fish can safely be consumed. EPA issued a national advisory for mercury in fish tissue in 2001, which remains in effect today. EPA adds impaired segments due to fish consumption advisories for mercury since the current Impaired Waters Identification Rule prohibits ADEQ from adding these waters directly. A map of current fish advisories and a list by county can be found at [HYPERLINK "http://www.azdeq.gov/node/1485"].

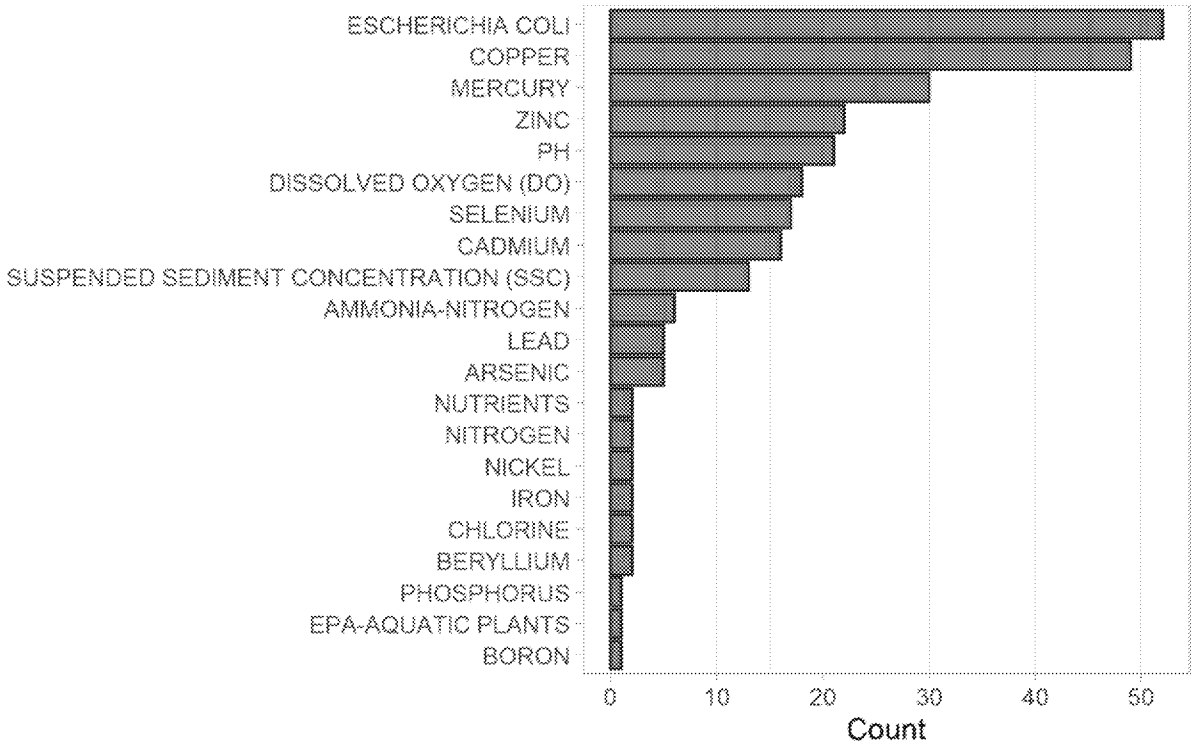

Figure 2-6. Causes of Impairment.

NEW IMPAIRED WATERS

In the 2022 assessment cycle, 42 new impairment parameters were identified that did not meet criteria for the designated use of waterbody (Table 2-4). This resulted in 33 new impaired waterbodies, meaning some waterbodies may have already been designated impaired with a different parameter. Santa Fe Reservoir (15010004-1340) and Horsethief Lake (15070102-0630) have new fish consumption advisories and will need to be listed as impaired by EPA. ADEQ does not currently have the authority to list waterbodies as impaired based on fish consumption advisories.

Table 2-4. 2022 Assessment New Impairments

WBID	Waterbody Name	Use	Parameter	Previous Impair?	Water Type	ASSESSED (Mi/Acres)
14070006-001	COLORADO RIVER	AWC	SELENIUM	NO	Stream	16.9
15010004-0710	KAIBAB LAKE	AWC	IRON	NO	Lake	61.2
15010004-1340	SANTA FE RESERVOIR	FC	MERCURY	NO	Lake	11.755
15030101-0590	LAKE HAVASU	AWW	SELENIUM	NO	Lake	19782.913
15030101-0960	LAKE MOHAVE	AWC	SELENIUM	NO	Lake	27044.497
15050100-012B	MINERAL CREEK (MIN)	AWW	MERCURY	YES	Stream	0.8
15050100-1662	DEVILS CANYON	AWW	COPPER	NO	Stream	12.9

WBID	Waterbody Name	Use	Parameter	Previous Impair?	Water Type	ASSESSED (Mi/Acres)
15050100-1662	DEVILS CANYON	AWW	MERCURY	NO	Stream	12.9
15050202-003	SAN PEDRO RIVER	AWW	DISSOLVED OXYGEN (DO)	YES	Stream	17
15050202-004	BABOCOMARI RIVER	FBC	ESCHERICHIA COLI	NO	Stream	32.7
15050202-006	SAN PEDRO RIVER	AWW	COPPER	NO	Stream	8.9
15050202-394	CURRY DRAW	FBC	ESCHERICHIA COLI	NO	Stream	5
15050202-425	GREENBUSH DRAW	PBC	ESCHERICHIA COLI	NO	Stream	11.5
15050203-003	SAN PEDRO RIVER	AWW	SELENIUM	NO	Stream	21.3
15050203-003	SAN PEDRO RIVER	FBC	ESCHERICHIA COLI	NO	Stream	21.3
15050301-009	SANTA CRUZ RIVER	AWEDW	NICKEL	YES	Stream	9.1
15050301-1070	PENA BLANCA LAKE	AWW	MERCURY	YES	Lake	50.547
15050301-558B	THREE R CANYON	AWW	NICKEL	YES	Stream	1.3
15050301-558B	THREE R CANYON	AWW	SELENIUM	YES	Stream	1.3
15050301-561B	ALUM GULCH	AWW	LEAD	YES	Stream	1.4
15050302-153A	DAVIDSON CANYON	AWE	COPPER	NO	Stream	13.6
15060103-004	SALT RIVER	DWS	ARSENIC	YES	Stream	7.5
15060105-013A	TONTO CREEK (TON)	AWC	DISSOLVED OXYGEN (DO)	YES	Stream	8.1
15060203-024	FOSSIL CREEK	FBC	ESCHERICHIA COLI	NO	Stream	19.9
15070102-031B	AGUA FRIA RIVER	AWW	SELENIUM	NO	Stream	17.8
15070102-031B	AGUA FRIA RIVER	AWW	ZINC	NO	Stream	17.8
15070102-033A	LYNX CREEK	AWC	CADMIUM	NO	Stream	13.1
15070102-033A	LYNX CREEK	AWC	COPPER	NO	Stream	13.1
15070102-033A	LYNX CREEK	AWC	ZINC	NO	Stream	13.1
15070102-034A	BIG BUG CREEK	AWC	CADMIUM	NO	Stream	5.7
15070102-034A	BIG BUG CREEK	AWC	ZINC	NO	Stream	5.7

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WBID	Waterbody Name	Use	Parameter	Previous Impair?	Water Type	ASSESSED (Mi/Acres)
15070102-034B	BIG BUG CREEK	AGL	COPPER	NO	Stream	23.3
15070102-034B	BIG BUG CREEK	AGL	LEAD	NO	Stream	23.3
15070102-034B	BIG BUG CREEK	AWW	COPPER	NO	Stream	23.3
15070102-034B	BIG BUG CREEK	FBC	ARSENIC	NO	Stream	23.3
15070102-034B	BIG BUG CREEK	FBC	LEAD	NO	Stream	23.3
15070102-039	LITTLE ASH CREEK (LAS)	AWW	DISSOLVED OXYGEN (DO)	NO	Stream	17.7
15070102-0630	HORSETHIEF LAKE	FC	MERCURY	NO	Lake	4.086
15070102-124	UNNAMED TRIB TO LYNX CREEK	AWC	COPPER	NO	Stream	1
15070102-234	UNNAMED TRIB TO BIG BUG CREEK (UB1)	AWC	COPPER	NO	Stream	1.3
15070102-234	UNNAMED TRIB TO BIG BUG CREEK (UB1)	AWC	ZINC	NO	Stream	1.3
15070102-768	EUGENE GULCH	AWE	COPPER	NO	Stream	3.1

NEW DELISTED WATERS

Twenty-eight parameters that were not meeting criteria in the previous assessment now meet criteria. This includes one waterbody that is a full delist which means that all parameter impairments were removed for that waterbody. For purposes of this report we say that these waters were 'delisted' even though only waters without a TMDL (EPA Category 5 waters) are technically on the impaired waters list. All delists for the 2022 assessment period were due to new data.

Delisted waters are divided into Category 5 and Category 4A waters based on whether a TMDL was done (Table 2-5). Category 5 waters are impaired waters without a TMDL. The East Verde River (15060203-022C) is a full delist and will not show up on the Impaired Waters List. 'Partial' delists means that the waterbody remains impaired due to another parameter even though the parameter listed in Table 2-5 now meets criteria. These waters remain impaired and will remain on the impaired waters list but the delist parameters will be removed.

Category 4 waters are "not-attaining", which means they are impaired but not placed on the Impaired Waters List (A.A.C. R18-11-601(11)). EPA does not place these on the impaired waters list even though they are impaired because these waters have a completed TMDL (4A) or approved pollution control (4B). This creates some confusion when data show that an impaired water with a TMDL is no

longer impaired. All Category 4 delists are partial delists which means the waterbody remains impaired for at least one other parameter.

Table 2-5. 2022 Assessment Delists.

WBID	Name	Use	Parameter	Full Delist?	Type	Miles / Acres
Category 5 (Impaired – No TMDL)						
15020010-018O	BLACK CANYON LAKE	AWC	AMMONIA-NITROGEN	PARTIAL	Lake	37.376
15050100-012B	MINERAL CREEK (MIN)	AWW	SELENIUM	PARTIAL	Stream	0.8
15050100-014A	QUEEN CREEK	AWW	SELENIUM	PARTIAL	Stream	9.9
15050202-008	SAN PEDRO RIVER	AWW	DISSOLVED OXYGEN (DO)	PARTIAL	Stream	28.3
15050301-008A	SANTA CRUZ RIVER	AWE DW	AMMONIA-NITROGEN	PARTIAL	Stream	4.8
15050301-013C	SONOITA CREEK	AWW	DISSOLVED OXYGEN (DO)	PARTIAL	Stream	9
15060106B-0300	CHAPARRAL PARK LAKE	PBC	ESCHERICHIA COLI	PARTIAL	Lake	12.529
15060202-025	VERDE RIVER	AWW	DISSOLVED OXYGEN (DO)	PARTIAL	Stream	25.2
15060203-022C	EAST VERDE RIVER	DWS	ARSENIC	FULL	Stream	25.8
15070102-023	AGUA FRIA RIVER	AWW	SELENIUM	PARTIAL	Stream	9.8
Category 4A (Not Attaining - TMDL Complete)						
15030202-005A	BOULDER CREEK	AWW	BERYLLIUM	PARTIAL	Stream	1.4
15030202-005A	BOULDER CREEK	AWW	COPPER	PARTIAL	Stream	1.4
15030202-005A	BOULDER CREEK	FBC	MANGANESE	PARTIAL	Stream	1.4
15030202-005A	BOULDER CREEK	AGL	PH	PARTIAL	Stream	1.4
15030202-005A	BOULDER CREEK	AWW	PH	PARTIAL	Stream	1.4
15030202-005A	BOULDER CREEK	FBC	PH	PARTIAL	Stream	1.4
15050301-558B	THREE R CANYON	AWW	BERYLLIUM	PARTIAL	Stream	1.3
15050301-558C	THREE R CANYON	AWE	CADMIUM	PARTIAL	Stream	2.9
15050301-558C	THREE R CANYON	AWE	ZINC	PARTIAL	Stream	2.9
15050301-561B	ALUM GULCH	AGL	ZINC	PARTIAL	Stream	1.4
15050302-0760	LAKESIDE LAKE	AWW	AMMONIA-NITROGEN	PARTIAL	Lake	14.46
15050302-0760	LAKESIDE LAKE	AWW	PH	PARTIAL	Lake	14.46
15050302-0760	LAKESIDE LAKE	PBC	PH	PARTIAL	Lake	14.46
15050302-0760	LAKESIDE LAKE	AWW	DISSOLVED OXYGEN (DO)	PARTIAL	Lake	14.46
15060105-353	CHRISTOPHER CREEK	FBC	ESCHERICHIA COLI	PARTIAL	Stream	8
15070102-036B	TURKEY CREEK	AWW	COPPER	PARTIAL	Stream	21
15070103-007A	HASSAYAMPA RIVER	AGI	PH	PARTIAL	Stream	11.3
Category 4B (Not Attaining – Pollution Control)						
15050301-001	SANTA CRUZ RIVER	AWE DW	AMMONIA-NITROGEN	PARTIAL	Stream	8.6

CHAPTER 3 - ASSESSMENT PROCESS AND METHODOLOGY

The Clean Water Act requires assessments to be conducted by states every two years and submitted to the EPA. According to EPA's 2014 integrated report memorandum, only 16 percent of states submitted on time for the 2012 assessment. ADEQ's last full assessment was completed in 2016, However, ADEQ submitted a list of impaired waters to the EPA in 2018. ADEQ drafted a 2020 assessment, which included data for the 2018 assessment. A delay in approval or disapproval of the 2019 standards prompted ADEQ and EPA to agree in a combined 2020 and 2022 assessment. Normally, an assessment covers a five-year window for data. However, combining the assessments resulted in a longer window (Figure 3-1).

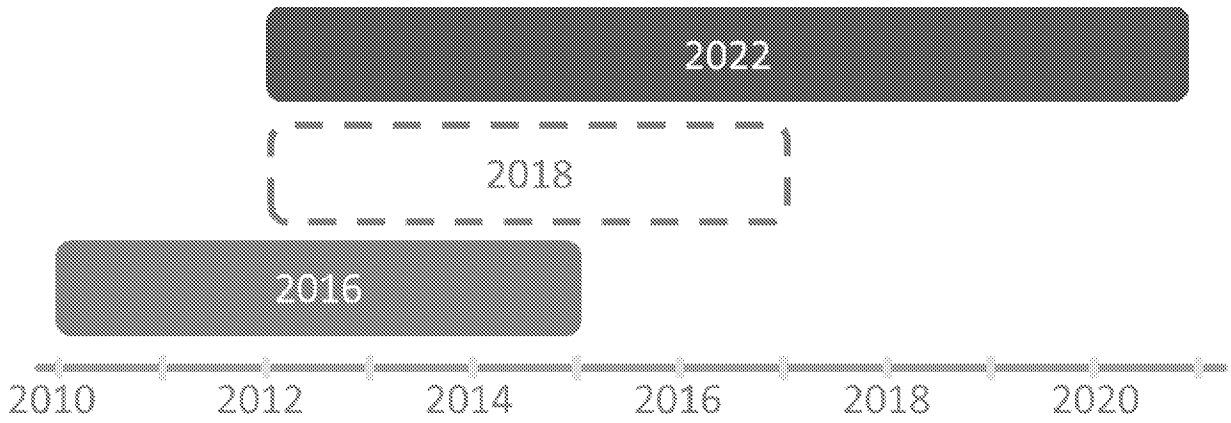

Figure 3-1. The 2022 Assessment covers a longer window since the 2018 and 2020 assessments were not submitted.

The Arizona Clean Water Act Assessment process can be broken down into six basic steps.

1. Preparing the Assessment;
2. Review of the Draft Assessment;
3. Public Comment;
4. Publish Comments and Impaired Water's List to the Arizona Administrative Register;
5. Submit to EPA/ATTAINS (Due April 1st of even years);
6. EPA Finalizes.

In 2013, EPA further divided the process into 26 steps and surveyed 31 states to understand which steps took the longest (Figure 3-2). The items in **red are technical in nature** while those in grey are more administrative. States identified gathering data, formatting data, and writing the assessment as the three steps with the greatest effort.

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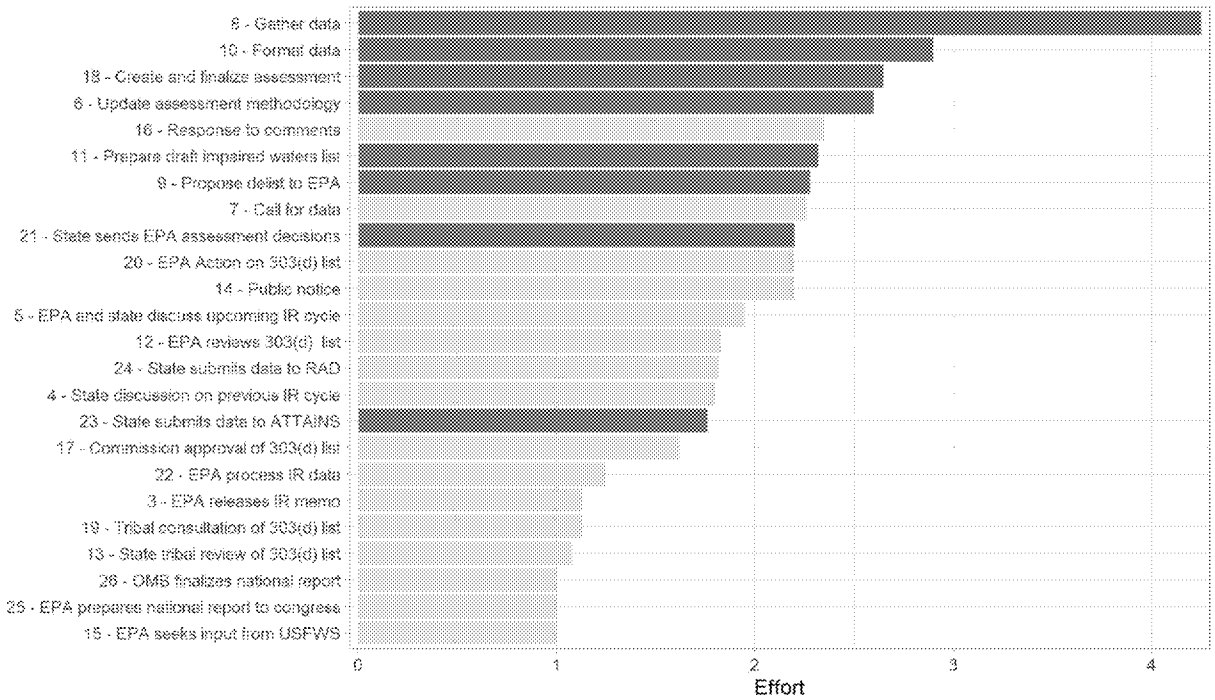

Figure 3-2. Results from states on which assessment steps take the most effort. Steps are broken out into technical and administrative. Note that the 26 steps were simplified to the six basic steps in the following sections.

Arizona's Assessment Tool

In 2018, ADEQ developed an 'Assessment Tool' to make assessment decisions faster. The Assessment Tool was built using R and modeled after states like New Jersey and South Carolina. R is an ideal platform to perform the technical parts of the assessment such as gathering data, standardizing units, aggregating data or comparing results to standards. R allows the data inputs and outputs to be processed much like an assembly line in a factory.

ADEQ reduced the time it took to complete the technical parts of the assessment from approximately 9 months to about 12 minutes. Arizona's Assessment Tool has essentially zeroed out the effort required for the technical aspects of the assessment.

Administrative factors are now the biggest impediment to Arizona completing the assessment by the April 1st deadline. The NWPR added a great deal of uncertainty to the 2022 assessment cycle by requiring knowledge of whether each waterbody met the requirements of the rule. ADEQ expended considerable time and effort attempting to comply with the NWPR and then had to adjust when the rule was vacated, which further delayed the process. There are several hidden administrative steps, like an informal EPA comment period, which have taken considerable time. ADEQ and EPA are working to streamline these processes to meet the Clean Water Act deadline.

STEP 1 - PREPARING THE ARIZONA CLEAN WATER ACT ASSESSMENT

Arizona's Assessment Tool takes data from the water quality portal ([HYPERLINK "http://www.waterqualitydata.us"]), calculates assessments based on Arizona standards and then pushes the final results to EPA's Assessment TMDL Tracking And Implementation System (ATTAINS).

ATTAINS retains a historical record of all assessments (Figure 3-2). Recent upgrades also track changes during each assessment cycle such as recording any changes made during the public notice period.

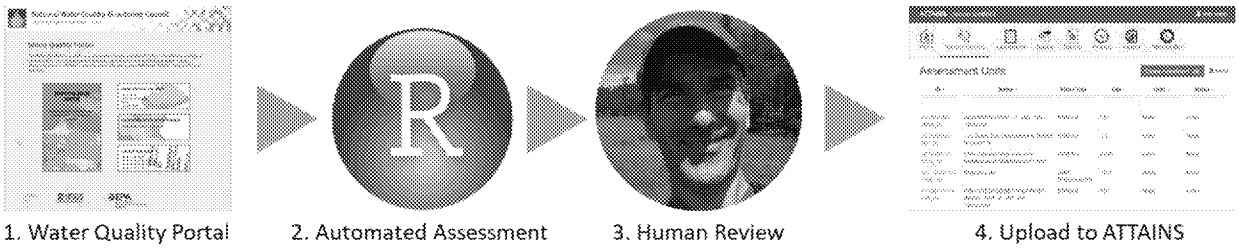

Figure 3-3. Data from the Water Quality Portal is Assessed, Reviewed and Sent to ATTAINS.

A. Gathering Data

States must consider all readily available data when preparing the Clean Water Act Assessment. The water quality portal ([HYPERLINK "http://www.waterqualitydata.us"]) is the main repository for the nation's water quality data and includes data from multiple organizations in a common format. ADEQ sends data to the portal through EPA's Water Quality Exchange (WQX) on a daily basis. This includes data collected by ADEQ and organizations that do not want to submit directly to WQX or the portal.

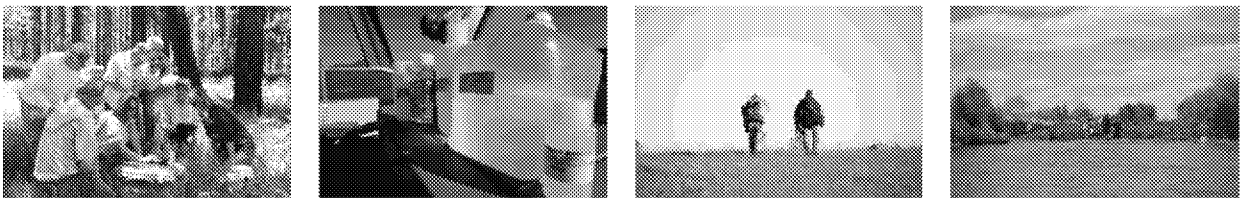

Figure 3-4. Assessment decisions rely on surface water quality data collected from people from many organizations.

Call for Data

ADEQ solicits data for the assessment through a 'Call for Data' each February. The most recent call for data was sent in February 2021 to 1,987 recipients and was posted on ADEQ's website.

Interested parties may subscribe to receive 'Request-for-Data' emails and other updates by clicking this link or copying and pasting into an internet browser: [HYPERLINK "https://public.govdelivery.com/accounts/AZDEQ/subscriber/new?topic_id=AZDEQ_62"]. Subscribe to the TMDL and/or Water Quality Improvement Grant list serves to be included in the next call for data.

To be considered in the assessment and listing process, data from agencies and other entities must have been received by May 1, 2021.

How to Submit Data

ADEQ prefers that data be loaded directly to the water quality portal. Instructions for uploading data to the portal can be found at [HYPERLINK "https://www.waterqualitydata.us/upload_data/"]. Alternatively, data can be submitted directly to ADEQ by following the surface water data submission

guidance document [HYPERLINK "http://static.azdeq.gov/swq/data_submittal_guidance.pdf"] (ADEQ, 2017).

Credible Data Requirements

ADEQ uses data that meets the credible data requirements defined in A.A.C. R18-11-602. The rule requires that:

- Data must be collected and analyzed following an appropriate Quality Assurance Plan (QAP) and Sampling and Analysis Plan (SAP), by adequately trained personnel using approved field and laboratory methods.
- Data must be evaluated to determine whether it is reliable, accurately reflects current water quality conditions, and is valid. This is determined by considering factors such as:
    - Laboratory detection limits,
    - Lab notations or qualifiers,
    - Whether the sampling was representative and reproducible,
    - Whether approved sampling and analysis methods were used, and
    - Quality control of the data when collected and analyzed.
- The monitoring entity must submit documentation that these requirements have been met and other information necessary to assist ADEQ in interpreting and validating the data.

Data from organizations that do not meet the Credible Data rule is excluded from the assessment and is not used to make impairment decisions.

B. Data Preparation and Formatting

The data preparation and formatting step has traditionally been the most time consuming part of the assessment. These steps have been significantly shortened by internal and external contributors entering data into the water quality portal and by using the assessment tool. ADEQ performs the following data preparation and formatting steps.

Exclusion of Tribal Data

Data located within tribal jurisdiction is excluded from the assessment.

Exclusion of Quality Control Samples

Quality control samples such as duplicates, splits and blanks are excluded from the assessment. Quality control samples are not used to evaluate surface waters because these data can unfairly weight the result for a particular time and day. Although quality control samples are not used directly in the assessment, they may be used to ensure that data is credible (appropriate number of quality control samples and results within acceptance criteria).

Reporting Units

Result and detection limit units are transformed to common units such as milligrams per liter (mg/L). This includes converting pH to hydrogen ion concentration so that summary statistics can be calculated.

Speciation

Some results from the water quality portal are reported in units like mg/l as NO3. A compound like nitrate that has a result of 10 mg/L as NO3 would need to be converted to Nitrate as N before it can be used in the assessment. Conversions are available in EPA's 2017 'Best Practices for Submitting Nutrient Data to the Water Quality eXchange).

Sample Values Less Than the Laboratory Reporting Limit

The Impaired Water Identification Rule (A.A.C. R18-11-603(A)(1)(b)) explains how to handle 'non-detects' with appropriate method reporting limits. "Less than" data can be used in trend analysis, descriptive statistics, or modeling as follows:

- If there are sufficient data to support statistically estimating the values reported as "less than" the reporting limit; or
- If there are not sufficient data to support statistically estimating the values reported as "less than" the reporting limit, then ADEQ will use one-half of the value of the reporting limit.

When the result is reported as less than the method reporting limit and that value is above the standard, the sample is not included in assessment. For example, a result of <5 mg/L that has a standard is 2 mg/L is not used in the assessment because results less than 5 can both exceed the standard and meet the standard.

Reviewing Dissolved and Total Standards

Dissolved results are used if a total result for the same parameter (same date and time and depth) is not available. Dissolved results with total standards are not used for delisting decisions.

Calculated Total Nitrogen

Total nitrogen is calculated for samples that have nitrate and nitrite and total Kjeldahl nitrogen (TKN) but do not have a total nitrogen value. Total nitrogen is calculated by adding standardized concentrations for nitrate and nitrite and TKN. TKN is calculated by adding ammonia and organic nitrogen.

Field Data

Field data is used instead of lab data for time sensitive parameters such as pH and dissolved oxygen.

Data Qualifiers

Water quality data and information may include data qualifiers or field comments that denote a deviation from acceptable sampling, handling, storage, or analytical procedures. Some data qualifiers invoke questions as to the accuracy of the data in representing the actual water quality conditions. For example, values reported by the laboratory as estimates are not used for listing decisions. ADEQ identifies qualifiers that compromise data quality in Chapter 10 of the Surface Water Sampling Standard Operating Procedures Manual (ADEQ, 2018) [HYPERLINK "http://static.azdeq.gov/wqd/sampling.pdf"]. Data qualified as 'Reject' from the water quality portal is excluded from the dataset. A case-by-case evaluation of the lab qualifiers from the water quality portal is used to determine the reliability of the data.

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Linking the Assessment Unit to the Monitoring Location

Water quality samples are taken at a site or monitoring location. Standards are assigned to an assessment unit or waterbody, which can have multiple sites. Each monitoring location is associated with a waterbody so that standards can be applied.

The assessment unit for a stream is the stream reach. Stream reaches were derived from EPA's Reach File System, which divide a stream into segments based on intervening tributaries. Over the years, these reaches have been further segmented to reflect changes in designated uses or differences in impairment.

The assessment unit for a lake is generally the entire lake.

Each assessment unit is assigned a unique number that identifies a particular waterbody (e.g., 15060202-028). Arizona uses a variant of the 8-digit hydrologic unit code number (HUC) for the drainage area, and

- A 3 or 4 digit/character stream reach number (derived from EPA's original Reach File System); or
- A 4-digit lake number (derived from AGFD's lake numbering system).

Multiple sampling sites can be located in each assessment unit.

Uses are assigned to waterbodies in rule (A.A.C. Title 18, Chapter 11, Article 1). Each use has specific parameters with specific criteria. For example, Boulder Creek (15030202-005A) has a designated use for fish consumption with a total arsenic criterion of 80 µg/L.

C. Aggregation

Spatial and temporal independence are determined after data has been prepared and formatted. Arizona's Impaired Water Identification Rule (A.A.C. R18-11-603(A)(4)) requires that samples be spatially and temporally independent.

Spatial Independence

Spatial independence prevents biasing results when many sites are sampled in the same assessment unit. Samples are considered spatially independent if they are collected more than 200 meters apart. Sites may be less than 200 meters apart if they were taken to characterize the effect of an intervening tributary, outfall, pollution source, or significant hydrographic or hydrologic change.

Temporal Independence

Temporal separation of samples is important in the assessment process, because surface waters should be identified as impaired only if the exceedances of water quality standards are persistent or recurring. Impairment decisions should not be based on one-time events that cause a temporary elevation in pollutant concentrations that may never be repeated. Similarly, a decision of "attaining" should also not be made based on samples collected all at one time.

Temporal separation of samples is ensured by first applying the 7-day rule and then grouping sites in the same assessment unit.

1. Temporal Aggregation - 7 Day Rule

If multiple samples are available at one site within a 7-day period, a representative value is determined. This value is counted as one sample for that one-week period at that site. The criteria listed in Table 3-1 is used to aggregate data within a 7-day period:

Table 3-1. Temporal aggregation rules.

PARAMETERS	REPRESENTATIVE 7-DAY VALUE
Dissolved oxygen	Minimum value
Acute aquatic and wildlife criteria, **Nitrate and nitrate/nitrite criteria,** ***E. coli* single sample maximum (SSM),** **Phosphorus and nitrogen SSM**	Maximum value
pH	Minimum or maximum (the pH standard is a range of numbers)
Chronic aquatic and wildlife criteria. **ALL OTHER DATA**	Use the mean value for the 7-day period

2. Temporal Aggregation - Group by Waterbody

If multiple sites have been sampled within the assessment unit within a seven-day period, they are counted as one sample, and one worst-case exceedance is used as the representative exceedance for the assessment unit. Grouping by waterbody happens after the 7-day rule.

Exceptions to the 2-step data aggregation

- Applying 90th Percentile standards to nutrient data or
- Applying geometric mean standards to *E. coli* bacteria data.

Data aggregation avoids over-counting exceedances (a type 1 error that would lead to listing when not impaired) and avoids over-counting samples collected during one week that could dilute out a problem (a type 2 error that would lead to not listing when impaired).

D. Assessing at the Parameter, Use and Assessment Unit Levels

Up to this point, data from the portal has been formatted, aggregated and compared to standards. The next step is to count the total number of samples and the number of samples that do not meet standards. These results are then rolled up to the parameter, use and assessment unit levels. Figure 3-5 illustrates how data from various inputs (data/standards/previous impairments/etc.) is run through the assessment calculator (the funnel) and produces outputs at the parameter, use and waterbody levels. EPA nomenclature for each level is shown below and will be used throughout this document to describe assessment decisions at each level.

1. **Parameter**. This is the lowest level and determines whether a particular waterbody, use and parameter **meets criteria** or **does not meet criteria**. Parameters that do not meet criteria are carried forward from previous assessments (Figure 3-6). This insures that impairments are tracked and prioritized for remediation. A parameter that was not meeting criteria for arsenic in 2000 will stay 'impaired' for arsenic on future assessments until there is a good reason to remove it (see the [HYPERLINK \l "_Delisting_Waters_by"]). Parameters that meet criteria or have insufficient information are also carried forward from previous assessments.

2. **Use**. Uses include aquatic and wildlife, fish consumption, recreation (body contact), domestic water source, agriculture irrigation, and agriculture livestock. Uses roll up from the parameter level and are either supporting or **not supporting** the use.
3. **Assessment Unit**. Assessment unit determinations are for the entire stream reach or lake. Attainment or **impairment** determinations roll up from the use level.

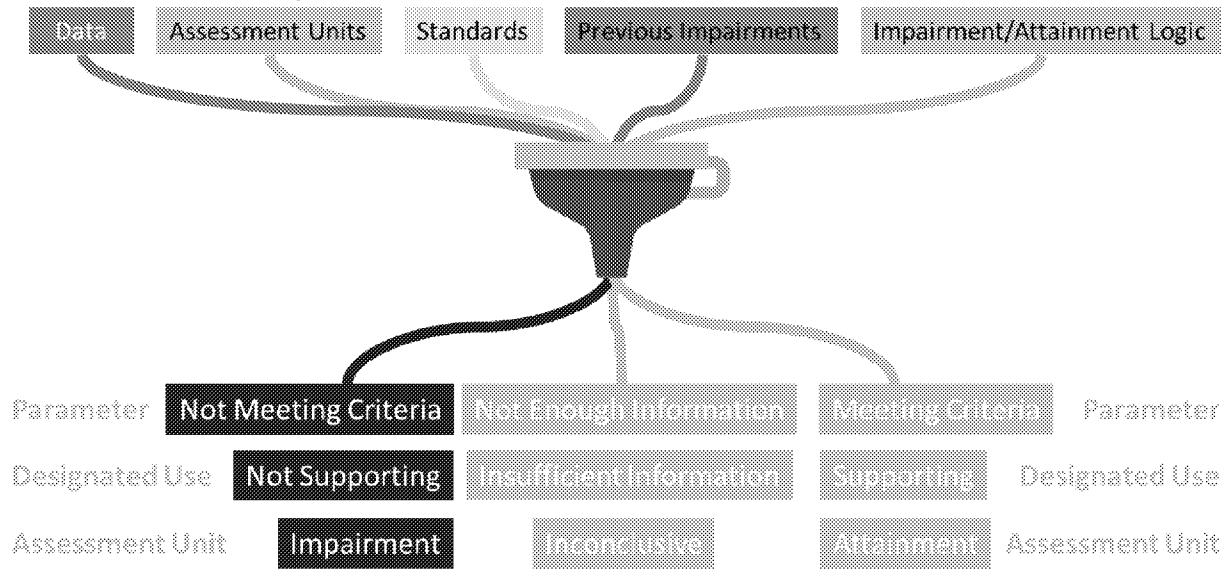

Figure 3-5. Assessment Inputs and Levels.

A parameter that **does not meet criteria** means that the use for that parameter is **not supported** and that the waterbody is **impaired**. For example, if arsenic is **not meeting criteria** for the domestic water source use then the domestic water source use is said to be **not supporting** and the waterbody is **impaired** (Figure 3-5).

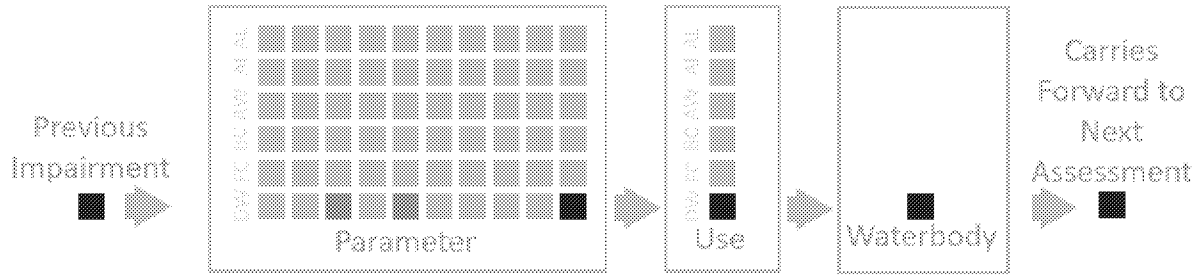

Figure 3-6. Illustration for how impairments at the parameter level can come from previous impairments and then roll up to the use and waterbody levels.

Attainment of a waterbody is harder to demonstrate than impairment. To demonstrate attainment all core parameters must be present, meet criteria and be seasonally distributed before a use can be said to be supporting (See [HYPERLINK \l "_Core_Parameters_and"]). All uses must be supporting for the waterbody to be attaining (Figure 3-7). Attainment, use support and meeting criteria decisions carry forward to the next assessment.

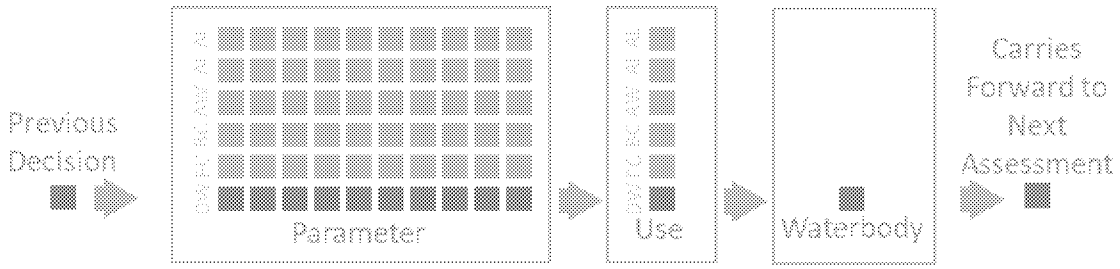

Figure 3-7. All core parameters in the proper seasons are needed to determine use support. All uses must support for the waterbody to be 'Attaining'.

Assessing at the Parameter Level

Aggregated data is compared to the appropriate standard to determine if criteria are met. Not meeting a standard does not mean that a waterbody is impaired. The number of aggregated samples **not meeting criteria** and the number of aggregated total samples needs to be considered before making impairment determinations.

The waterbody's designated uses must be known to determine what standards apply. For example, Boulder Creek (15030202-005A) has a designated use for fish consumption and a total arsenic criterion of 80 µg/L. An aggregated result of 82 µg/L would not meet criteria, while an aggregated result of 62 µg/L would meet criteria.

Some standards are more complex. These include:

- Dissolved oxygen (depth specific in lakes, criteria met if above the limit or if the percent saturation is above 90);
- Hardness dependent standards (standard criteria changes depending on the hardness value);
- Suspended sediment concentration (excludes storm samples, criteria is a median of 4 samples);
- Ammonia (dependent on both pH and temperature);
- Nutrient standards (single sample maximum, annual mean and 90 percentile);
- pH (the only standard that has a range, criteria not met if outside the range);
- *Escherichia coli* (has both a single sample maximum standard and a geometric mean value, both have different criteria).

EPA uses the terms meeting criteria, **not meeting criteria** and not enough information to describe assessment at the parameter level. The term 'exceedance' is also used to describe when a parameter is not meeting criteria even though parameters like dissolved oxygen or pH may have 'exceedances' that are below the standard rather than exceeding the standard. Numeric parameters are included in Appendix A of Arizona Administrative Code Title 18, Chapter 11 and in R18-11-109.

The methods for determining if criteria are being met vary by type of criteria and potential toxicity of the pollutant. A pollutant that exceeds an acute aquatic and wildlife standard even once, for example, may be lethal to aquatic life and wildlife. On the other hand, some of the human health standards were set at levels that protect for lifetime exposures. Several criteria use 'the last three years of monitoring'. This means using a three-year window from the last day of the assessment

window rather than the full assessment window. For the 2022 assessment, the last three years would be from July 1, 2018 to June 30, 2021.

Table 3-2 summarizes the assessment criteria used to determine whether criteria at the parameter level are meeting criteria, **not meeting criteria** or classified as not having enough information.

Table 3-2. Criteria for each parameter

	Exceedance Definition	Assessed As Not Meeting Criteria	Assessed As Not Enough Information	Assessed As Meeting Criteria
ALL CRITERIA FOR Body Contact, Fish Consumption, Domestic Water Source, Agriculture Irrigation, Agriculture Livestock Watering PH AND DISSOLVED OXYGEN NITROGEN AND PHOSPHORUS SINGLE SAMPLE MAXIMUM CRITERIA	1 exceedance = 1 grab sample exceeds a criterion	At least 10% of samples exceed criterion at a 90% confidence rate; Minimum of 5 exceedances (See following binomial-based table)	If an exceedance, insufficient data to determine if criteria are met (see criteria to left)	No exceedances see following binomial-based table
ACUTE CRITERIA Aquatic and Wildlife NITRATE OR NITRATE/NITRITE CRITERIA Domestic Water Source *E. COLI* BACTERIA SINGLE SAMPLE MAXIMUM CRITERIA Body Contact	1 exceedance = 1 grab sample exceeds a criterion	Two or more exceedances during the last 3 years of monitoring	Only one exceedance during the last 3 years of monitoring	No exceedances during the last 3 years of monitoring
CHRONIC CRITERIA Aquatic and Wildlife	1 exceedance = 1 grab sample exceeds a criterion and absence of contextual information indicating unstable conditions	Two or more exceedances during the assessment period	Only one exceedance during the assessment period	No exceedances during the assessment period
E. COLI BACTERIA GEOMETRIC MEAN CRITERIA Body Contact	1 exceedance = the geometric mean of at least 4 samples taken during a 30-day period exceeds a criterion	Two or more exceedances during the assessment period	Only one exceedance during the assessment period	No exceedances (Sufficient data to calculate a monthly geometric mean is not required)
NITROGEN AND PHOSPHORUS ANNUAL MEAN CRITERIA Body Contact and Aquatic and Wildlife	1 exceedance = the annual mean of at least 3 monthly means exceeds a criterion	Two or more exceedances during the assessment period	Only one exceedance during the assessment period; or Many samples exceeded the criterion although the annual mean was not exceeded	No exceedances (Sufficient data to calculate an annual mean is not required)

	Exceedance Definition	Assessed As Not Meeting Criteria	Assessed As Not Enough Information	Assessed As Meeting Criteria
NITROGEN AND PHOSPHORUS 90th PERCENTILE CRITERIA **Body Contact and Aquatic and Wildlife**	1 exceedance = the 90th Percentile of at least 10 samples collected at least 10 days apart exceeds a criterion.	Two or more exceedances during the assessment period	Only one exceedance during the assessment period; or Many samples exceeded the criterion although the 90th Percentile was not exceeded	No exceedances (Sufficient data to calculate a 90th Percentile is not required)
SUSPENDED SEDIMENT CONCENTRATION MEDIAN CRITERION **Aquatic and Wildlife**	1 exceedance = the median of at least 4 consecutive samples collected at least 7 days apart exceeds the criterion, excluding samples collected during or within 48 hours of a local storm event	Two or more exceedances during the assessment period	Only one exceedance during the assessment period; or Many samples exceeded the criterion, but the median did not exceed the criterion or could not be calculated due to insufficient data	No exceedances (Sufficient data to calculate a median is not required)
TOTAL DISSOLVED SOLIDS FLOW-WEIGHTED ANNUAL MEAN CRITERIA **On the Colorado River**	1 exceedance = the flow-weighted mean of all samples collected during a 12-month period exceeds a site-specific criterion.	Two or more exceedances during the assessment period	Only one exceedance during the assessment period; or Many samples exceeded the criterion although the annual mean was not exceeded.	No exceedances (Sufficient data to calculate a flow-weight mean is not required)

The 'Binomial Approach'

Most criteria for parameters listed in Appendix A of the surface water quality standards use the binomial distribution, which defines the minimum sample requirements based on the number of samples collected (Table 3-3). Collecting the minimum number of samples ensures that there is at least a 90 percent confidence level that there is a 10 percent or greater exceedance rate.

EPA's CALM document (2002) suggests that an exceedance rate greater than 10 percent for conventional parameters, such as dissolved oxygen and pH, indicates impairment of a designated use. ADEQ has extended this approach to Arizona's human health standards that were established to protect for 70-year lifetime exposure periods, since an exceedance rate under a 10 percent should not negatively impact human health (with the exception of *E. coli* bacteria and nitrate which are pollutants that can be acutely toxic to humans).

The Impaired Waters Identification Rule currently requires at least 20 samples to determine impairment (A.A.C. R18-11-605(D)(1)) regardless of the number of exceedances. The rule should have considered the number of exceedances for the minimum sample size. For example, if the first

five samples exceeded then a waterbody should be classified as impaired because it doesn't matter if the next 15 meet criteria.

Table 3-3. Criteria for binomial parameters based on number of samples and number of samples not meeting criteria. NA = Not applicable.

Samples Collected		Minimum Exceedances		Maximum Exceedances
FROM	TO	Not Meeting Criteria (Binomial)	Not Enough Information	Meeting Criteria
3	9	NA	NA	0
10	15	NA	3	2
16	19	NA	4	3
20	23	5	4	3
24	32	6	5	4
33	40	7	6	5
41	47	8	7	6
48	55	9	8	7
56	63	10	9	8
64	71	11	10	9
72	79	12	11	10
80	88	13	12	11
89	96	14	13	12
97	104	15	14	13
105	113	16	15	14
114	121	17	16	15
122	130	18	17	16
131	138	19	18	17
139	147	20	19	18
148	146	21	20	19
157	164	22	21	20

Aquatic and Wildlife Acute Standards

Toxic pollutant criteria for the Aquatic and Wildlife use were developed to protect for shorter periods of exposure (compared to chronic standards) due to the shorter lifespan of the aquatic life and wildlife they protect. Studies show that test organisms can tolerate no more than one exceedance of either the acute or the chronic aquatic and wildlife criteria. In fact, studies show that even one exceedance can cause damage if the magnitude of exceedance was very high or the affected area was very large (EPA, 1991). A statistical approach based on a percentage of exceedances, such as the binomial, is not valid for these standards and would not protect the designated use.

Acute criteria protect against short-term effects of high-level pollutant concentrations, which include lethality and immobilization. Acute criteria protect for one-hour exposure periods. Aquatic life may recover from one exceedance of criteria per three-year period; however, recovery is not likely if even minor exceedances occur more often. Determinations that parameters are **not meeting criteria** are based on two or more exceedances in a three-year period, regardless of whether the sample size is small or large. The three-year period for acute standards is determined by subtracting three years from the end of the assessment window.

Note that although listing based on one large exceedance could potentially be justified, it is ADEQ's policy, and standard practice throughout the country, that listings will be made only if evidence is available to show that the impairment is persistent or recurring. Therefore, two or more exceedances are needed to make a 303(d) listing. This requirement is also consistent with EPA assessment guidance recommendations: CALM (2002), Guidance for 2006 Assessment, Listing and Reporting (2005), and the Technical Support Document for Water Quality-based Toxics Control (1991).

Aquatic and Wildlife Chronic Standards

"Chronic" conditions for aquatic life are determined by as short as a four-day exposure, as compared to a one-hour exposure for acute criteria. The four-day period was selected by EPA to develop chronic criteria because it was the shortest duration over which chronic effects are sometimes observed. Longer exposures would be even more likely to cause chronic impacts. Chronic exposures can be lethal to aquatic organisms, although the effects are not usually immediate upon exposure. Chronic impacts include disease, behavioral abnormalities, inability to reproduce, reduced growth and survival, physical abnormalities, genetic mutations and eventual death.

EPA's Technical Support Document (1991) and current assessment guidance documents indicate that an aquatic community should be able to recover from one chronic exposure every three years, unless there is a long exposure duration. Therefore, ADEQ's assessment method determines that a parameter is **not meeting criteria** when there are two or more 'exceedances' during the assessment period. Parameters that **do not meet criteria** mean that the applicable use is **not supported** and the waterbody is **impaired**.

EPA's Assessment Guidance (EPA, 2006) recommends that for criteria with multiple day averaging periods (such as chronic criteria), states should develop decision rules for concluding impairment where information indicates a reasonable likelihood that the average was exceeded. For example, if conditions have remained stable over the period of interest (four days), it would be valid to use a grab sample to represent that period.

ADEQ has developed a method for determining chronic criteria exceedances based on grab samples. This method assumes that stable conditions were occurring at the time unless there is information to the contrary. ADEQ looks at the following information to determine whether 4-day stable conditions were occurring when criteria are not met:

- Gaging station records, when available;
- Field notes and weather records concerning precipitation and runoff;
- Point source discharge records in the reach or immediately upstream;
- Land uses in the vicinity;
- Records of chemical spills or other unusual events; and
- Historic patterns of pollutant concentrations, when available.

If readily available contextual information indicates that the pollutant and stream flow likely remained constant over that four-day period, ADEQ will conclude that the grab sample result is valid for the chronic Aquatic and Wildlife criteria.

Chronic results that are not collected under stable conditions are excluded from the assessment. This data will not be used for listing decisions when unstable conditions are likely, especially in

watersheds with precipitation-dependent sources of pollutants (e.g., mine tailings piles). Examples of evidence of unstable conditions include, but are not limited to, samples being collected during:

- A precipitation event with runoff lasting shorter than 4-days;
- The first flush of a precipitation event; or
- A short-lived but high intensity monsoon flow.

In a lake, stable conditions will assume to be occurring unless lake "turnover" or other disturbances are documented when the sample was collected. Lake temperature profiles and other field information will be used to look for such disturbances.

In a lake or stream, if one or more point source discharges provide a significant contribution to the receiving water, the facility discharge records are reviewed to determine whether flow and associated pollutant discharges were relatively consistent during the four-day period when the exceedance occurred.

Weight of Evidence

In addition to the 'bright-line' numeric standards, there are many other factors that can be considered deciding if a parameter does not meet the criteria in Table 3-2. A true weight-of-evidence approach considers multiple environmental indicators (biological, toxicological, physical, and chemical measurements) in assessing water quality. However, the 303(d) listing decisions are based primarily on chemical-physical measurements with numeric water quality standards, because biological and toxicological results cannot be used until narrative standard implementation procedures are adopted and/or the Impaired Waters Identification Rule is revised to allow for impairments based on narrative standards.

The weight of evidence approach in A.A.C. R18-11-605(B) allows ADEQ to consider contextual information during the assessment process, such as:

- **Data quality** –Newer or more reliable data is given more weight than data where quality is more questionable, especially where two different datasets may indicate conflicting results.
- **Critical conditions and locations** – Critical conditions describe patterns in the data causing the impairment of an assessment unit such as stormflow, seasonality, low flow, or anthropogenic activities. Data may be segregated when it is demonstrated that impairment occurs during 'critical conditions. Critical locations are the locations at which critical conditions apply. Critical conditions and locations are identified in Appendix B.
- **Waterbody Improvements**. Waterbodies that do not show persistent, seasonal or recurring conditions are not placed on the impaired waters list. This includes waterbody improvements such as a wastewater treatment plant upgrade. Data before the improvement are filtered out of the dataset unless it is determined that the improvement is not effective.
- **Evidence of toxic impacts** – Evidence of toxic impacts include fish kills, fish consumption advisories, harmful algal blooms, beach closures, and bioaccumulation in prey species.
- **NPDES/AZPDES information** – Water quality discharge data or compliance issues with the pollutant of concern.
- **Anthropogenic influences** – Activities in the watershed, especially adjacent to an assessment unit, that might be the source of a pollutant.
- **Natural conditions and characteristics of the pollutant** – Geomorphology, geology, hydrology, and characteristics of the pollutant are considered when establishing whether the

exceedance was solely due to natural conditions or whether human activities may be contributing to the exceedance, or provide other support for a listing decision.

For example, flow conditions are a crucial piece of information when reviewing the data for streams. In some systems, stream flow volume is regulated by impoundments and diversions to accommodate irrigation, industrial cooling water or hydroelectric needs. Low flows may be the critical condition when an adit or other point source discharge is the primary source of pollutant loadings.

High flows resulting from precipitation events are variable and hard to predict. Duration, frequency, magnitude, time of year, land use and applied treatments are all factors that influence the impact a precipitation event may have on stream flow volume and corresponding water quality. For nonpoint sources of pollutants, high flow conditions will frequently result in pollutant loading from the watershed.

These factors do not supersede any minimum data requirements.

Assessments Based on Nitrate and *E. coli* Criteria

Nitrate (or nitrate/nitrite) and *E. coli* bacteria are two pollutants that may be acutely toxic to humans. The Impaired Water Identification Rule established the same assessment criteria as used for acute Aquatic and Wildlife criteria. Criteria are not met if there are two or more exceedances of the single sample maximum criteria during the last three years of a monitoring period.

Assessments Based on Statistically Derived and Site-Specific Standards

Statistically derived standards include:

- *Escherichia coli* geometric mean;
- Suspended sediment concentration (SSC) median;
- Nutrient 90th percentile;
- Nutrient annual mean; and
- Total dissolved solids (TDS) flow-weighted annual mean in the Colorado River.

When two or more exceedances of a statistically-derived standard occur, the parameter is assessed as **not meeting criteria** and the surface water is assessed as **impaired**.

Escherichia coli Geometric Mean

The *Escherichia coli* bacteria geometric mean standard is applied only to locations with a minimum of four samples in a 30-day period (e.g., Slide Rock State Park on Oak Creek). Single sample maximum criteria are also applied to *E. coli* (see discussion above.) For assessment purposes, a 30-day period is interpreted as one month. Temporal aggregation does not apply to the *E. coli* geometric standard. Therefore, any four consecutive samples collected at a single site in a single month can be used to calculate one geometric mean for the site. Samples taken at the same time, date, location and depth are aggregated using the median (duplicates/splits).

Using the Suspended Sediment Concentration Standard

In 2002, ADEQ adopted a Suspended Sediment Concentration (SSC) standard to protect Aquatic and Wildlife designated uses and concurrently repealed the turbidity standard. SSC standards were revised in 2009 creating a different standard for warm and cold waters. The standard for SSC is 80

mg/L for aquatic and wildlife warmwater and 25 mg/L for aquatic and wildlife cold water, expressed as a median value of a minimum of four samples collected at least seven days apart. The standards do not apply to lakes or to ephemeral or effluent-dependent streams.

Any SSC samples collected during or within 48 hours of storm events are excluded from the median calculation. Storm events within 48 hours of the sampling event are checked by looking at field notes, site comments, USGS flow data, or NOAA precipitation records.

Nutrient 90th Percentile

A minimum of 10 samples taken 10 days apart in a consecutive 12-month period is needed to determine the 90th percentile for the site-specific nutrient standards.

Nutrient Annual Means

The annual mean is defined in A.A.C. R18-11-101(4) as "the arithmetic mean of monthly values determined over a consecutive 12-month period, provided that monthly values are determined for at least three months. A monthly value is the arithmetic mean of all values determined in a calendar month." At least two independent monthly samples are needed to calculate the monthly mean.

Total Dissolved Solids Flow Weighted Annual Mean for the Colorado River

In accordance with A.A.C. R18-11-110, a flow weighted annual mean shall be used to determine if salinity criteria are met.

Site-Specific Standards

Appendix C of the surface water quality standards lists site specific standards for several waterbodies. These standards override the standards listed in Appendix A for these assessment units.

Delisting Waters by Parameter

Waterbodies with parameters that **do not meet criteria** are placed on the 303(d) Impaired Water's List. This section describes the process for determining that a parameter that caused a waterbody impairment is no longer impaired. See '[HYPERLINK \l "_Delisting_Waters_by"]' for other ways a waterbody can be delisted.

If the delisting is based on new data, then the number of samples required and the number of exceedances depend on the criteria used for listing, as shown in the following table:

Table 3-4. Delisting criteria by parameter.

	Exceedance Definition	Assessed As No Longer Impaired
ALL CRITERIA FOR **Body Contact,** **Fish Consumption,** **Domestic Water Source,** **Agriculture Irrigation,** **Agriculture Livestock Watering** **PH AND DISSOLVED OXYGEN** **NITROGEN AND PHOSPHORUS** **SINGLE SAMPLE MAXIMUM CRITERIA**	1 exceedance = 1 grab sample exceeds a criterion	Minimum 10 samples and no more than the maximum exceedances shown in "Meeting Criteria" column in the binomial-based table (Table 3-3)

	Exceedance Definition	Assessed As No Longer Impaired
ACUTE CRITERIA **Aquatic and Wildlife** **NITRATE OR NITRATE/NITRITE CRITERIA** **Domestic Water Source** ***E. COLI* BACTERIA SINGLE SAMPLE MAXIMUM CRITERIA** **Body Contact**	1 exceedance = 1 grab sample exceeds a criterion	No exceedances during the last three years of monitoring the parameter of concern
CHRONIC CRITERIA **Aquatic and Wildlife**	1 exceedance = 1 grab sample exceeds a criterion and absence of contextual information indicating unstable conditions	No exceedances during the assessment period and parameter of concern samples were collected
***E. COLI* BACTERIA GEOMETRIC MEAN CRITERIA** **Body Contact**	1 exceedance = the geometric mean of at least 4 samples taken during a 30-day period exceeds a criterion	Sufficient samples to determine at least two monthly geometric means and no exceedances
NITROGEN AND PHOSPHORUS ANNUAL MEAN CRITERIA Body **Body Contact** **Aquatic and Wildlife**	1 exceedance = the annual mean of at least three monthly means exceeds a criterion	Sufficient samples to determine at least two annual means and no exceedances
NITROGEN AND PHOSPHORUS 90th PERCENTILE CRITERIA **Body Contact** **Aquatic and Wildlife**	1 exceedance = the 90th Percentile of at least 10 samples collected at least 10 days apart exceeds a criterion	Sufficient samples to determine at least two 90th Percentiles and no exceedances
SUSPENDED SEDIMENT CONCENTRATION MEDIAN CRITERION **Aquatic and Wildlife**	1 exceedance = the median of at least four consecutive samples collected at least 7 days apart exceeds the criterion, excluding samples collected during or within 48 hours of a local storm event	Sufficient samples to determine at least two medians and no exceedances
TOTAL DISSOLVED SOLIDS FLOW-WEIGHTED ANNUAL MEAN CRITERIA **On the Colorado River**	1 exceedance = the flow-weighted mean of all samples collected during a 12-month period exceeds a site-specific criterion	Sufficient samples to determine at least two annual flow-weighted means and no exceedances

Samples should be collected during critical conditions or locations, if either applies.

Assessing at the Use Level

Results from the parameter level are rolled up to the use level to determine if a use for a particular waterbody is supported or is **not supported**.

Results that were determined to be **not meeting criteria** for a parameter and use mean that the entire use is **not supporting**. For example, if an assessment unit is **not meeting criteria** for the fish consumption designated use for arsenic then the fish consumption designated use for this waterbody would be said to be '**not supporting**'.

Core Parameters and Seasonal Distribution

Monitoring data are collected at sites and during conditions selected to be representative of the varying conditions. Samples must be collected under different conditions to determine whether the surface water is really supporting its designated uses since a water quality standard might be more likely to be exceeded during conditions such when recreation is more active during the summer.

ADEQ uses a set of indicators, called "core parameters" to determine if each designated use is being supported. Arizona's core parameters are shown in the Table 3-5. Core parameters were selected based on EPA's CALM guidance (2002).

Table 3-5. Core parameters.

DESIGNATED USE	CORE PARAMETERS
Aquatic and Wildlife	Dissolved oxygen (not required if ephemeral) Stream flow (if a stream) Sample depth (if a lake) pH Total nitrogen (if nutrient standards established) Total phosphorus (if nutrient standards established) Dissolved cadmium, copper, and zinc and hardness
Fish Consumption	Mercury in fish tissue (no minimum sample or seasonal distribution requirement). If fish tissue data is not available, use total mercury in water as a core parameter (minimum sample and seasonal distribution requirements apply).
Full Body or Partial Body Contact	*Escherichia coli* (not required if ephemeral) pH
Domestic Water Source	Nitrate/nitrite or nitrate pH Fluoride Total arsenic, chromium or chromium VI, and lead
Agricultural Irrigation	pH Total boron and manganese
Agricultural Livestock Watering	pH Total copper and lead

Core parameters were chosen using the following criteria:

- Frequently exceeded standards in past assessments;
- Routinely included in ambient monitoring suites;
- Lab reporting limits routinely below applicable surface water criteria;
- Critical toxicity recognized; and
- Standards and implementation procedures support application of the criteria.

For example, dissolved metals exceedances and low pH measurements are often found in historic mining areas. *E. coli* bacteria and nitrate were chosen because they can cause serious human illness or death if standards are exceeded, and they are important in determining support of Body Contact and Domestic Water Source designated uses.

Core parameters must be sampled at least three times and samples must be distributed to reflect seasonal changes (seasonally distributed). For assessment purposes, at least one sample must be collected in three of the four seasons:

- Winter (January – March);
- Spring (April – June);
- Summer (July – September);
- Fall (October – December).

If this does not occur then the designated use is assessed as insufficient information. Uses assessed as **not supporting** overrule supporting and insufficient information determinations.

Supporting decisions are not limited to core parameters. All parameters with surface water quality criteria are considered. For a use to be supporting all core parameters must be present and seasonally distributed. Parameters that are not core parameters do not have to be meeting criteria for the use to be supporting. A parameter that does **not meeting criteria** will always have a use of **not supporting** regardless of whether it is a core parameter.

ADEQ acknowledges that three sampling events are not enough to assess use support with statistical confidence. However, three seasonally distributed samples with no exceedances indicate that monitoring resources may be better spent at other sites. Such attainment decisions reflect limited monitoring resources and ADEQ's focus on identifying and resolving water quality impairments.

Assessing at the Assessment Unit Level

Results from the use level are rolled up to the assessment unit or waterbody level to determine if a waterbody is attaining or **impaired**. Results that were determined to be **not supporting** for a use mean that the entire waterbody is **impaired**. For example, if an assessment unit is **not supporting** for the fish consumption designated use then the entire waterbody is **impaired**.

EPA created five categories for reporting assessments to provide a summary of states' water quality status to Congress. EPA categorical system can get a little confusing as Category 4 and 5 waters are reported at the parameter level while categories 1 through 3 are at the assessment unit level. For example, Christopher Creek (15060105-353) is listed as category 4 for Escherichia coli but Category 5 for dissolved oxygen. The overall assessment unit category when both a Category 4 and 5 is present is Category 5.

Category 1: Supporting all designated uses

Assessment units with sufficient data to determine that all designated uses are supporting. In these assessment units, at least three samples were collected to represent seasonal differences for all core parameters for each use.

Category 2: Supporting some designated uses, and no use is impaired

Assessment units with sufficient data to determine that one or more designated use is supporting and the remaining designated uses are assessed as insufficient information. No use is classified as **not supporting**. The specific reasons a designated use is assessed as insufficient information can vary, but in general there are not enough samples to decide as to whether the use is supporting or **not supporting**.

Category 3: Insufficient or no data and information to determine if any designated use is supporting

Assessment units with insufficient data to assess any designated use as supporting or **not supporting**. All designated uses are assessed as insufficient information.

Category 4: Not supporting for one or more designated uses but a TMDL is not necessary

Assessment units with at least one use assessed as **not supporting** but development of a TMDL analysis is not needed, for the following reasons:

Category 4A – Includes assessment units where a TMDL has been completed for specific pollutants. The TMDL is an investigative study of pollutant sources that includes recommendations for pollutant reductions. Note that the TMDL is a budget and is not actual remediation. The Impaired Water Identification Rule considers an assessment unit with a TMDL in place as 'not attaining'. These waters are still **impaired** and listed in Category 4A until it is attaining standards again. The TMDL remains in effect even if a waterbody is 'delisted'.

Category 4B – (Not Common) Assessment units where alternative pollution control requirements are being used to meet standards, rather than a TMDL. To be categorized as 4B, ADEQ must submit to EPA for evaluation and review the following information:

- Statement of the problem causing the impairment, identifying pollutants and their sources;
- Description of the alternative pollution controls being implemented, including the funding mechanism for any associated costs and binding agreements to complete implementation;
- Reasonable time schedule for implementation of controls;
- Projection of when water quality standards will be met;
- Description of and schedule for monitoring, that will show progress with the control strategy;
- Commitment to revise the control strategy if progress towards meeting water quality standards is not being shown.

Category 4C – (Not Common) Assessment units where the impairment is not caused by a pollutant, but instead by other types of pollution. For example, a designated use may be impaired solely due to lack of adequate flow or stream channelization. In such cases, the specific cause and source of the impairment has been carefully studied, generally through the TMDL process.

On the other hand, although low dissolved oxygen is not a pollutant, under EPA assessment guidance it is listed as the cause of impairment and a TMDL is required when the low dissolved oxygen is caused by the presence of a pollutant (e.g., nutrients or chemical oxygen demand). Similarly, low or high pH is listed as the cause of impairment in Category 5, rather than 4C, when pollutants are thought to be causing or contributing to the impairment. To date, ADEQ has not used Category 4C.

Category 5: Not supporting for one or more designated uses by a pollutant, and a TMDL needs to be developed or revised

Assessment units with at least one designated use classified as **not supporting** and a Total Maximum Daily Load analysis needs to be completed. The assessment unit remains in Category 5 until EPA has approved the TMDL or the pollutant is otherwise delisted. Only category 5 waters are placed on the 303(d) impaired water's list (Appendix C).

Delisting Waters by Waterbody

The Impaired Water Identification Rule currently provides criteria to determine when an assessment unit is no longer **impaired** (R18-11-605(E)). An assessment unit is removed from the 303(d) List when the TMDL is completed or alternative pollution control requirements have made the development of a TMDL unnecessary. These waters are still **impaired** even though a TMDL has been

completed. ADEQ uses the term 'not attaining' to distinguish impairments that have a completed TMDL.

As required in the TMDL Statute §49-232(C)(4), the criteria for establishing that an assessment unit is no longer impaired cannot be any more stringent than the criteria for adding an assessment unit to the impaired water list.

Criteria to determine if a waterbody is "no longer impaired":

- The water quality criterion is no longer exceeded due to a change in standard or designated use;
- New data indicate that the parameter is meeting criteria, and the new data was collected during critical conditions if critical conditions apply;
- Reevaluation of the assessment information indicates an error or deficiency in the original analysis resulted in an inappropriate listing;
- Pollutant loadings from naturally occurring conditions are the sole cause of the criterion not being met;
- One reach is split into two segments. One reach remains impaired. The other reach may be removed if no current or historic data exists that would support listing a portion of the impaired reach.

When to Exclude Waterbodies from being Listed as Impaired

The Impaired Water Identification Rule identifies situations when an assessment unit may be excluded from the impaired waters list. Surface waters are not assessed as impaired when:

- Pollutant loadings from naturally occurring conditions alone are sufficient to cause a violation of water quality standards (A.A.C. R18.11.604(C)(1));
- Water quality results were collected under a moderating provision of an NPDES/AZPDES permit, such as a mixing zone, and the result does not exceed any discharge limitation established in the permit (A.A.C. R18-11-604(C)(2));
- The non-attainment is due to an activity or situation exempted under the surface water quality standards in R18-11-117 (canals and municipal park lakes), R18-11-118 (dams and flood control structures) or R18-11-119 (natural background).

If an assessment unit is impaired solely due to naturally occurring conditions (no human-caused influences), the surface water is not listed based on the exemption provided by A.A.C. R18-11-119. ADEQ will add waters to the impaired waters list that are due to a combination of natural and human causes. During the TMDL analysis the determination of what is natural and human caused will be determined and properly allocated.

The TMDL investigation can also determine whether a site-specific standard or use-attainability analysis should be developed to address the naturally occurring pollutant loadings. 40 CFR 131.10(g) provides that site-specific criteria can be adopted when waters cannot attain standards because of naturally occurring pollutant concentrations or legacy pollutants. However, the human-caused impacts would be subject to reduction and/or remediation through the TMDL process to bring the water quality back into attainment of the pollutant concentrations that would naturally occur.

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Other Considerations

Fish Tissue Data

Some chemical pollutants concentrate in fish and shellfish by accumulating in fatty tissue or selectively binding to muscle tissue. These pollutants may be found at low concentrations in the water column or in bottom sediments, but bioaccumulate in aquatic life and species that prey on aquatic life. Bioaccumulation poses a threat to human health if the organisms are eaten on a regular basis in excess of state and federal fish consumption advisory levels. In January 2001, EPA issued a national advisory concerning risks associated with mercury in freshwater fish, especially for women who are pregnant or may become pregnant, nursing mothers, and young children.

ADEQ issues fish consumption advisories if the mean minus one standard deviation for a minimum of five fish per species exceeds the mercury standard of 0.3 mg/kg. ADEQ, in association with AGFD, issues a fish consumption advisory based on one or more exceedances of fish tissue mercury for certain fish species.

Swimming Area Closures, Harmful Algal Blooms, Fish Kills, and Drinking Water Advisories

In previous assessments, ADEQ has used issuance of swimming beach closures, documentation of fish kills, harmful algal blooms or issuance of a drinking water advisory on an assessment unit used for domestic water supply as indications of impairment. Impairment determinations for these types of public health advisories cannot be made until implementation procedures are developed and the Impaired Waters Identification Rule is updated.

Applying Narrative Standards

No impairment determinations were made in the assessment based on narrative standards. ADEQ used macroinvertebrate and bottom deposit data in the 2022 assessment to assess the aquatic life wildlife designated use to demonstrate where there was insufficient information to make an assessment decision. If chemistry data indicated that the use was supporting but **criteria was not met** for macroinvertebrate or bottom deposit data then the overall aquatic life use was classified as insufficient information. These narratives and their associated numeric criteria will be used to identify impaired waters in future assessments, after the Impaired Waters Identification Rule is revised to include them.

Nutrient criteria

ADEQ is conducting investigations to revise stream and lake nutrient criteria, in accordance with EPA's 1998 National Nutrient Criteria Initiative requiring states to develop nutrient criteria or adopt USEPA ecoregion criteria. ADEQ's water quality standards currently contain stream nutrient criteria for nitrogen and phosphorus for ten perennial streams and their perennial tributaries, which are used in this assessment. New nutrient criteria for lakes were proposed in 2009, but were disapproved by EPA, and are not currently used in the assessment. ADEQ is currently working with EPA through the 'N-STEPS' technical advisory committees to revise the lake nutrient criteria and to develop statewide stream nutrient criteria. Criteria are expected to be proposed in the next triennial review of water quality standards in approximately 2025.

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Prioritizing the 303(d) List

Prioritization criteria for scheduling TMDL development are established in the Impaired Water Identification Rule (A.A.C. R18-11-606). A prioritization for TMDL development is provided in Appendix D.

High priority factors:

- The pollutant is listed for eight or more years on the 303(d) Impaired Waters List;
- Substantial threat to health and safety of humans, aquatic life, or wildlife based on toxicity of the pollutant and magnitude or duration of the exceedance;
- The presence of a Threatened or Endangered species (T&E species) that may be further jeopardized by the water quality pollutant. This is determined by looking at critical habitat, published reasons for decline and vulnerability of the species, and discussions with the AGFD and the U.S. Fish and Wildlife Service;
- Special protection of the water resources, such as classification as an outstanding Arizona water", wilderness area, wild and scenic river, or other state or federal designation;
- Delay in the TMDL could jeopardize a timely permit action or ADEQ's ability to gather sufficient credible data to support the TMDL;
- Public interest and support for development of the TMDL;
- The assessment unit has an important recreational and economic significance.

Medium and low priority ranking factors:

The Impaired Water Identification Rule states that several low priority factors can take precedence over high priority factors because completing a TMDL at this time would either be inappropriate, premature, or an inefficient use of resources. The low priority factors that exceed high priority factors include:

- ADEQ has formally submitted to EPA a proposal to delist the surface water or pollutant based on new data, new standards, or new designated uses;
- Flow conditions inhibit collecting samples during critical conditions or a variety of conditions necessary for modeling;
- The uncertainty of timely coordination with Mexico, another state, or a tribal nation needed to conduct the TMDL or implement necessary watershed improvements;
- The assessment unit is expected to attain water quality standards due to:
    - Changes in treatment or best management practices;
    - Discharges or activities related to impairment have stopped;
    - Other controls are in place or scheduled;
- Naturally occurring conditions are the major contributor to the impairment.

TMDL Program Audit

ADEQ's TMDL program was reviewed by the state auditor general in 2021 (Arizona Auditor General, 2021). The auditor indicated that ADEQ has not developed some TMDLs or tracked due dates, or reviewed existing TMDLs to identify needed changes. The auditor's findings pointed out that 70 waters have been on the 303(d) list for 15 years or more and that ADEQ has not updated TMDLs every five years as required by A.R.S. § 49-234(J).

ADEQ has hired a contractor to catalog existing TMDLs and better track future TMDLs. This project will help identify informational gaps needed to restore impaired waters. ADEQ is also looking at programmatic changes to address the development of future TMDLs.

STEP 2 – REVIEW OF THE DRAFT ASSESSMENT

The draft assessment is sent to EPA for an informal review before it goes out to public comment. ADEQ signed an agreement with EPA in 2017, which is effective until 2022. The 2017 performance partnership agreement states:

> 3. INFORMAL COMMENT PROCESS
> a. When possible ADEQ will provide the EPA opportunities to review and comment on documents subject to EPA jurisdiction prior to the public comment period.
> b. ADEQ will make attempts to adequately address the EPA's comments and will make modifications in the document as is reasonable and prudent.
> c. Where provided the ability to comment prior to official public comment, EPA will endeavor to provide comments during that informal review period to the extent practicable.

Coordinating with Neighboring Jurisdictions

Affected states, tribes or countries are directly notified of any new impairments or delistings at the same time the EPA is completing the informal review. Arizona may work with neighboring jurisdictions during several stages of the assessment process, including standards development and assessment methods development. Comments received are evaluated and additional discussion may be initiated. If a conflict cannot be resolved between ADEQ and the other jurisdiction, EPA will be notified.

ADEQ's Border Program works with any issues including impairments that involve Mexico. However, international resolution of impaired waters is a very complex matter, involving high-level actions, and requiring coordination with State Departments of both nations.

STEP 3 - PUBLIC COMMENT

This assessment is provided for public review and comment. Interested stakeholders are encouraged to comment about criteria used to make attainment and impairment decisions about Arizona's waters. ADEQ will review the comments and make changes as appropriate and publish the comments, response to comments and changes in the Arizona Administrative Register before the final assessment is completed and submitted to EPA.

Public participation and review are important aspects of developing the integrated assessment and listing report. The public comment period for the assessment is 30 days. The draft assessment and instructions for how to comment are posted under the 'public notices' portion of ADEQ's website at [HYPERLINK "http://azdeq.gov/notices"].

STEP 4 - PUBLISH TO ARIZONA ADMINISTRATIVE REGISTER

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ADEQ's response to public comments and the revised 303(d) impaired waters list are published in the Arizona Administrative Register. Notices are placed in the register for 45 days as required by A.R.S § 49-232(A).

The listing of an assessment unit or pollutant can be appealed pursuant to A.R.S. Title 41, Chapter 6, Article 10 by anyone who submitted comments on the draft list. If a notice of appeal is filed, the listing involved is not included in ADEQ's submission to EPA until the listing is upheld by ADEQ's Director or the appeal is withdrawn.

STEP 5 - SUBMISSION TO ATTAINS

ATTAINS tracks the assessment starting with Step 3 – public comment. ADEQ updates ATTAINS with changes after the public comment period and after the submission to the Arizona Administrative Register (Step 4). ADEQ then finalizes the assessment in ATTAINS and sends EPA Region 9 the following:

- A cover letter;
- Copies of comments received on the draft and ADEQ's responses to those comments;
- Documentation of the public process used;
- An electronic version of the assessment through ATTAINS;
- A link to the full Clean Water Act Assessment document;
- Geographic Information System (GIS) shapefiles for streams and lakes that list the assigned EPA category.

Arizona's ATTAINS data can be accessed at [HYPERLINK "https://www.epa.gov/waterdata/attains"]. Final assessment results are not publicly viewable until the assessment is finalized by EPA (see step 6).

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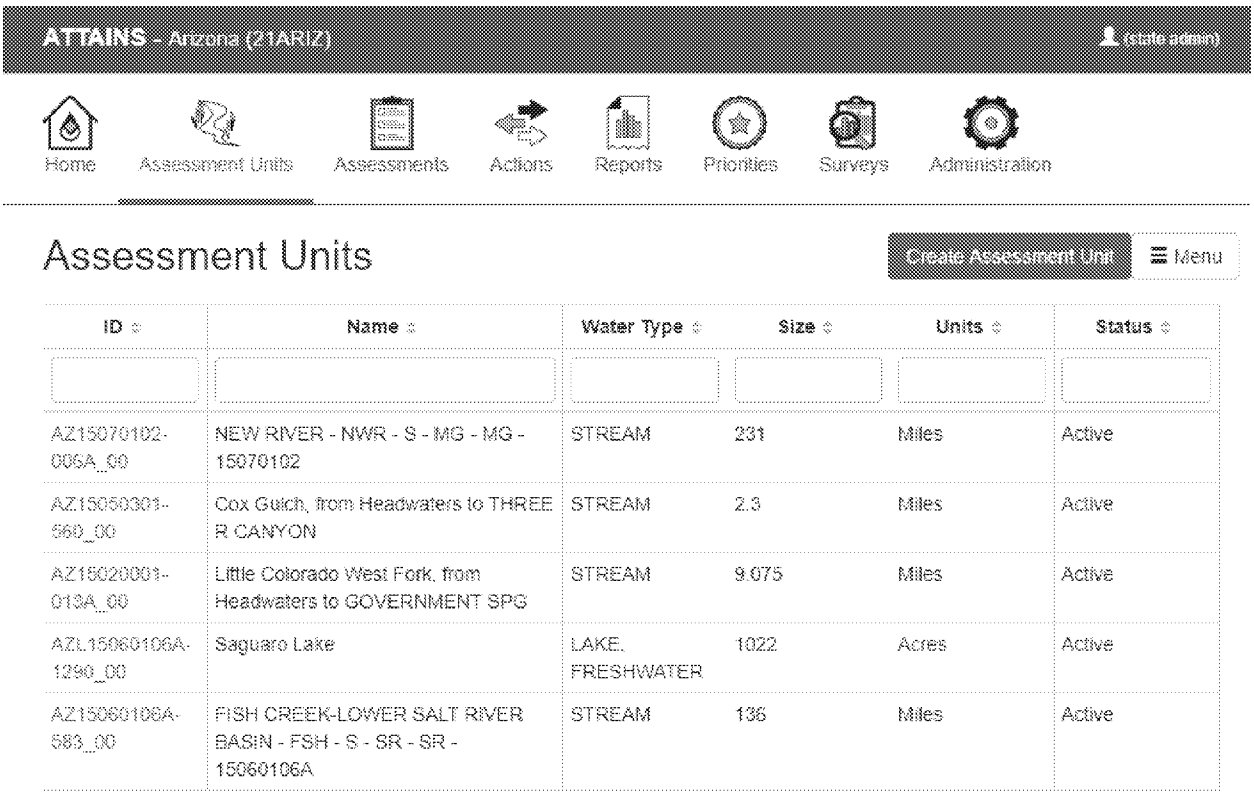

ID	Name	Water Type	Size	Units	Status
AZ15070102-006A_00	NEW RIVER - NWR - S - MG - MG - 15070102	STREAM	231	Miles	Active
AZ15050301-560_00	Cox Gulch, from Headwaters to THREE R CANYON	STREAM	2.3	Miles	Active
AZ15020001-013A_00	Little Colorado West Fork, from Headwaters to GOVERNMENT SPG	STREAM	9.075	Miles	Active
AZL15060106A-1290_00	Saguaro Lake	LAKE, FRESHWATER	1022	Acres	Active
AZ15060106A-583_00	FISH CREEK-LOWER SALT RIVER BASIN - FSH - S - SR - SR - 15060106A	STREAM	136	Miles	Active

Figure 3-8. EPA's ATTAINS tracks historical assessments and changes to the current assessment

STEP 6- EPA FINALIZES

The 303(d) List of impaired waters is either approved, disapproved, or partially approved / disapproved by EPA within 30 days. If a portion of the list is partially approved or disapproved, EPA proposes changes to the list and initiates another public review and comment period. Proposed revisions to Arizona's 303(d) List are published in the Federal Register. EPA works with ADEQ to attempt to notify all interested parties of this publication. At the end of the comment period, EPA evaluates public comments and compiles the final approved 303(d) List. EPA provides comments to ADEQ for the assessment report even though only the 303(d) impaired waters list is subject to approval.

In the past, EPA has identified assessment units and pollutants of concern that needed to be added to Arizona's impaired water list to make the list consistent with federal regulations (over-filings). In subsequent assessments, EPA must decide when these additional impairments are removed from Arizona's 303(d) List. In this respect, these impairments are tracked separately. However, once listed by EPA, ADEQ recognizes these waters as impaired, initiates TMDL according to priorities, and protects them from further pollutant loadings according to Arizona's antidegradation rules and permit requirements.

CHAPTER 4 – ACTION PLAN

Monitoring and assessing waters are part of a process to identify impaired waters and then reduce discharges of pollutants in the watershed. Waters in Category 4 and 5 are protected under Arizona's Antidegradation Rule (A.A.C. R18-11-107), as "Tier 1" waters. No further degradation by that pollutant is allowed. Potential pollutant loadings must be considered by ADEQ and several federal agencies before permits or certifications are issued (e.g. AZPDES discharge permits, grazing permits).

Figure 4-1. Aerial view of legacy mine remediation activities on Boulder Creek (15030202-005A) which was delisted for beryllium, copper and pH and manganese.

WATER QUALITY IMPROVEMENT STRATEGIES

Over the years, ADEQ has employed several methods to restore and delist waterbodies. Such methods include:

- Total Maximum Daily Load (TMDL) development;
- Watershed plan development;
- Direct-funded remediation and restoration projects.

A TMDL establishes the maximum amount of a pollutant a waterbody can withstand without exceeding surface water quality standards. In general, a TMDL identifies the source(s) of pollution,

conditions leading to the impairment and reductions necessary to attain water quality standards. Pollution can originate from two types of sources: point and nonpoint. Point sources are discrete conveyances of pollutants discharged directly to a surface water, such as wastewater treatment plant outfalls. Nonpoint sources are non-discrete discharges, including storm water runoff influenced by activities such as grazing, recreation, agriculture and forestry.

Associated point source waste load allocations and nonpoint source load allocations are established in the TMDL. Point source waste load allocations are then incorporated into AZPDES permits to reduce contamination. There are few regulatory actions available to control nonpoint source pollution, so load reductions from these sources are primarily voluntary. Nonpoint source pollution may include excessive sediment caused by the denudation of grasslands, road erosion near streams, bacteria from wildlife and/or recreation, metals from road cuts through ore bodies, and pesticides from historic agricultural practices.

In some instances, ADEQ combined a TMDL with an Implementation Plan that identified generic strategies, agencies or groups who potentially would be involved in implementation, a tentative schedule, and how effectiveness of improvements would be determined. Once a TMDL study was complete, the ADEQ Water Quality Improvement Grant Program would then work with interested stakeholders to implement water quality improvement projects. As experienced by other states, Arizona has not seen enough of a reduction in nonpoint source pollution leading to delists.

ADEQ has also developed Clean Watershed Plans (previously Watershed Improvement Plans) as a means to meet regulatory requirements while also accelerating restoration and delists. Clean Watershed plans provide an analytic framework for managing efforts to both restore water quality in known areas of impairment and to maintain overall watershed health in areas of good water quality. These watershed plans are then championed by local non-government organizations (NGOs) to implement best management practices in order to reduce nonpoint source pollution voluntarily.

Common components of watershed plans include:

- Identification of causes and sources of pollution;
- Estimate of current pollutant loading into the watershed and the expected load reductions;
- Descriptions of management measures that will achieve load reductions and targeted critical areas;
- Estimates of technical and financial assistance and the stakeholder support needed to implement the plan;
- A project schedule;
- Descriptions of interim, measurable milestones;
- Indicators to measure progress;
- A monitoring and evaluation component;
- A framework for adaptive management (Plan, Do, Check, Act).

ADEQ's Nonpoint Source (NPS) Program considers many different factors when prioritizing nonpoint source activities:

- Human health concerns;
- Ecosystem health including ecological risk;
- The beneficial uses of water;
- Value of the watershed or groundwater basin to the public;

- Vulnerability of the surface or ground water to additional environmental degradation;
- Ability to implement;
- Likelihood of achieving demonstrable environmental results;
- Extent of alliance with other federal agencies and states to coordinate resources and actions;
- Readiness to proceed.

Additional information on ADEQ's Nonpoint Source Program is online - [HYPERLINK "http://azdeq.gov/node/315"].

Since 2018, ADEQ's Nonpoint Source Program has continued to fund grant projects while also direct funding the agency's prioritized projects. Taking the above prioritization factors into account, ADEQ has remediated five legacy mining sites that contributed metal contamination to nearby impaired streams. ADEQ is monitoring water quality improvements at each of these sites. In Boulder Creek near Bagdad, Arizona, remediation of old mine tailings and a discharging adit led to delisting five parameters from this section of the creek. For copper alone, there was a 90% reduction; plus, fish returned after remediation. After a project was completed in the Patagonia Mountains, water quality improvements showed three parameters could be delisted from 3R Canyon.

This effort integrates many components of an Abandoned Mine Land program, utilizes existing TMDLs and watershed plans, and contributes to a watershed-scale effort to realize nonpoint source load reductions. Such projects are summarized online - [HYPERLINK "http://azdeq.gov/node/7368"]

ADEQ has also invested nonpoint source funding to restoration projects in Oak Creek, which is impaired for *E.coli*. These projects leverage existing watershed plans and TMDLs to implement improvement projects and encourage engagement at the local level. Such projects are summarized online: [HYPERLINK "http://azdeq.gov/node/8049"]

REFERENCES

ADEQ. 2017. Surface Water Data Submission Guidance. [HYPERLINK "http://static.azdeq.gov/swq/data_submittal_guidance.pdf"]

ADEQ. 2018. An Assessment of Arizona's Intermittent Streams. [HYPERLINK "http://static.azdeq.gov/wqd/reports/int_streams_2018.pdf"]

ADEQ. 2018. Sampling Standard Operating Procedures Manual. [HYPERLINK "http://static.azdeq.gov/wqd/sampling.pdf"]

Arizona Auditor General. 2021. Arizona Department of Environmental Quality Performance Audit Report 21-116. [HYPERLINK "https://www.azauditor.gov/sites/default/files/21-116_Report.pdf"]

Arizona Secretary of State. 2016. Arizona Administrative Code (currently the EPA approved standards). [HYPERLINK "https://static.azdeq.gov/wqd/SW_Standards_12_31_16.pdf"]

Arizona State Legislature. 2019. Arizona Statutes. [HYPERLINK "https://www.azleg.gov/arstitle/"]

EPA. 1991. Technical Support Document for Water Quality-based Toxics Control. Office of Water. PA/505/2-90-001. [HYPERLINK "https://www3.epa.gov/npdes/pubs/owm0264.pdf"]

EPA. 1998. National Nutrient Criteria. [HYPERLINK "https://www.epa.gov/sites/production/files/2018-10/documents/nutrient-strategy-1998.pdf"]

EPA. 2002. Consolidated Assessment and Listing Methodology – Toward a Compendium of Best Practices (CALM)(A framework for states to collect and analyze water quality related data in support of water quality assessments and impairment decisions.) [HYPERLINK "https://www.epa.gov/waterdata/consolidated-assessment-and-listing-methodology-calm"].

EPA. 2006. Guidance for 2006 Assessment, Listing, and Reporting Requirements Pursuant to Sections 303(d). [HYPERLINK "https://www.epa.gov/tmdl/integrated-reporting-guidance-under-cwa-sections-303d-305b-and-314"]

EPA. 2013. "Reducing Reporting Burden Under Clean Water Act Sections 303(d) and 305(b)". [HYPERLINK "https://www.epa.gov/tmdl/final-report-reducing-reporting-burden-under-clean-water-act-sections-303d-and-305b"]

EPA. 2015. "Information Concerning 2016 Clean Water Act Sections 303(d), 305(b), and 314 Integrated Reporting and
Listing Decisions" [HYPERLINK "https://www.epa.gov/sites/production/files/2015-10/documents/2016-ir-memo-and-cover-memo-8_13_2015.pdf"]

EPA. 2017. Performance Partnership Agreement

EPA. 2017. Best Practices for Submitting Nutrient Data to the Water Quality eXchange. [HYPERLINK "https://www.epa.gov/waterdata/wqx-nutrients-best-practices-guide"]

ED_013248_00000307-00047

EPA. 2018. EPA Integrated Reporting (IR) Categories and How ATTAINS Calculates Them. [HYPERLINK "https://www.epa.gov/sites/production/files/2018-09/documents/attains_calculations_of_epa_ir_categories_2018-08-31.pdf"]

EPA. 2019. Integrated Reporting Guidance under CWA Sections 303(d), 305(b) and 314. [HYPERLINK "https://www.epa.gov/tmdl/integrated-reporting-guidance-under-cwa-sections-303d-305b-and-314"].

ED_013248_00000307-00048